**University of Alberta**

# The Sedimentology and Geochemistry of the Second White Specks Formation, North/Central Alberta, Canada

by

Kelli H.A. Fraser ©

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Master of Science

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## Dedication

This thesis is dedicated to all those that I love most dearly. Especially to my family who has always been there to support me in every aspect. To my mother, Shannon Fraser, my father, Douglas Fraser, and my brother, Andrew Fraser. There will never be such excellent and admirable people. And to Wayne Peters, my beloved friend who passed away before his time, I will always miss you.

# Abstract

Deposition of the calcareous and organic carbon-rich Cenomanian-Turonian Second White Specks Formation occurred during maximum transgression of the Western Interior Seaway with corresponding high organic productivity in the upper water column and anoxic bottom waters. The Formation has been well studied in southern Alberta, however, less is known about the unit's properties in central and northern Alberta. To characterize the Formation in central and northern Alberta, paleontology, palynology, sedimentology and geochemistry have been used with geophysical logs to produce a basin-wide framework.

The shale is unique due to its potential as both a source and reservoir rock for hydrocarbons. Geochemically, some maximum values for the unit include: 1331 ppb Ag, 140 ppm Cu, 169 ppm Mo, 290 ppm Ni, 469 ppm Zn, 22.1 % S and 10.8 % organic carbon. Some locations are enriched enough in organic carbon and metals to be geochemically classified as a metalliferous black shale.

# Acknowledgements

I would like to thank my supervisor, Dr. Octavian Catuneanu, for supporting me through this process, and for all of his help. I am indebted to Dr. Reg Olson, Dr. Randy Rice and Dr. Glen Prior, whose help and support throughout the whole of my masters program was essential. Thank-you to Dr. Sarah Gleeson. Your advice and recommendations have always been appreciated. Thank-you to the Alberta Geological Survey for providing financial support for this thesis in addition to NSERC support from a research grant to Dr. Catuneanu. I would also like to thank the staff at the Alberta Geological Survey for their valued help and support. A special thank you to Natasha Blundon for all of her help with Arcview.

I appreciate and would like to thank the University of Alberta for supporting me, both as a teaching assistant and throughout my masters. I am grateful to the support staff at the University of Alberta and the Earth and Atmospheric Sciences Department, especially the Digital Imaging Facility and the Thin Section Lab. I am indebted to all of my colleagues for their time and help throughout my two years at the University of Alberta. I would also like to extend thanks to the staff at the Gallagher Library at the University of Alberta.

I am grateful to the staff at the Calgary Core Research Center for their patience and innumerable sample bags. Thank-you as well to those at the Edmonton Minerals and Core Research Facility. I appreciate the great work of Claudia Schroder-Adams on the micropaleontology and Graham Dolby for his work on the palynology.

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# 1.0 INTRODUCTION:

## 1.1 Introduction

Shales are extremely important within the sedimentary record because they represent fairly continuous sediment packages (Potter et al., 1980) and they embody a large portion of the sedimentary record during the Cretaceous within Alberta. With the supply of hydrocarbons from conventional reservoirs in Alberta being reduced, more and more exploration and production companies are seeking out unconventional reservoirs. Today, by employing new technologies, it is becoming more economic to explore for shale gas. The Cretaceous Second White Specks Formation is a shale that is found within the Alberta Colorado Group and extends across the Western Canadian Sedimentary Basin (Bloch et al., 1999). The shale is of interest because it has potential as both a source and reservoir rock (Leckie et al., 1994). Previous studies have also shown that the black organic rich shale contains anomalous metal concentrations (Dufresne et al., 2001). Thus, the Second White Specks Formation has the potential to be economic for both the oil and gas and minerals industry. Much research, however, still needs to be conducted in order to assess the economic value of the shale.

It has been suggested that the Second White Speckled Shale, which was studied in a geochemical context in the Birch Mountains of northeastern Alberta, could be a distal member of a sedimentary-exhalative or nickel-molybdenum deposit due to the higher concentrations of metals in comparison with surrounding formations (Dufresne et al., 2001, Reg Olson personal communication, 2002). Elemental concentrations such as 3.1 % Ba, 510 ppm Ni, 1010 ppm Zn, 352 ppm Mo, 470 ppm As, 51 ppm Sb, 3.6 ppm Ag, 17.3 % S, 1322 ppm V, 180 ppm Co, 138 ppb Au, 22 ppb Pt and 14 ppb Pd were obtained from surface and subsurface samples in the combined study by Dufresne et al. (2001) and Tintina Mines Limited (Sabag, 1996). It is therefore necessary from a geochemical point of view to evaluate whether or not the Second White Specks Formation is a metalliferous shale, and whether or not there are any changes seen in the geochemical signature across the basin within Alberta.

The knowledge base of the Second White Specks Formation is much more extensive in southern Alberta and Saskatchewan; therefore, an investigation of the lithological variations of this shale across the basin is required in conjunction with the geochemical investigation. The study of the Second White Speckled Shale in central and northern Alberta will allow for the combination of previous studies in southern Alberta to be extended into central and northern Alberta.

## 1.1 Study Area

Although the Second White Specks Formation is basin-wide in extent with equivalent units in Saskatchewan and Manitoba (Leckie et al., 1994), this study focuses on the formation within Alberta. The study area is bound by townships 44 to 101 and ranges 01 W4 to R13 W6 (see Figure 1.1) and a close-up of the locations and the associated unique well identifiers for each well are attached in Figure 1.2 and Table 1.1. The original core for this study came from the Birch Mountains (northeastern Alberta indicated by the blue circles in Figure 1.1). The well information was then extended into central Alberta for a basin wide study, thus allowing the comparison of geochemical signatures herein with those from the report of Dufresne et al., (2001). In addition, a total of six cross sections were constructed and are discussed in the following chapter.

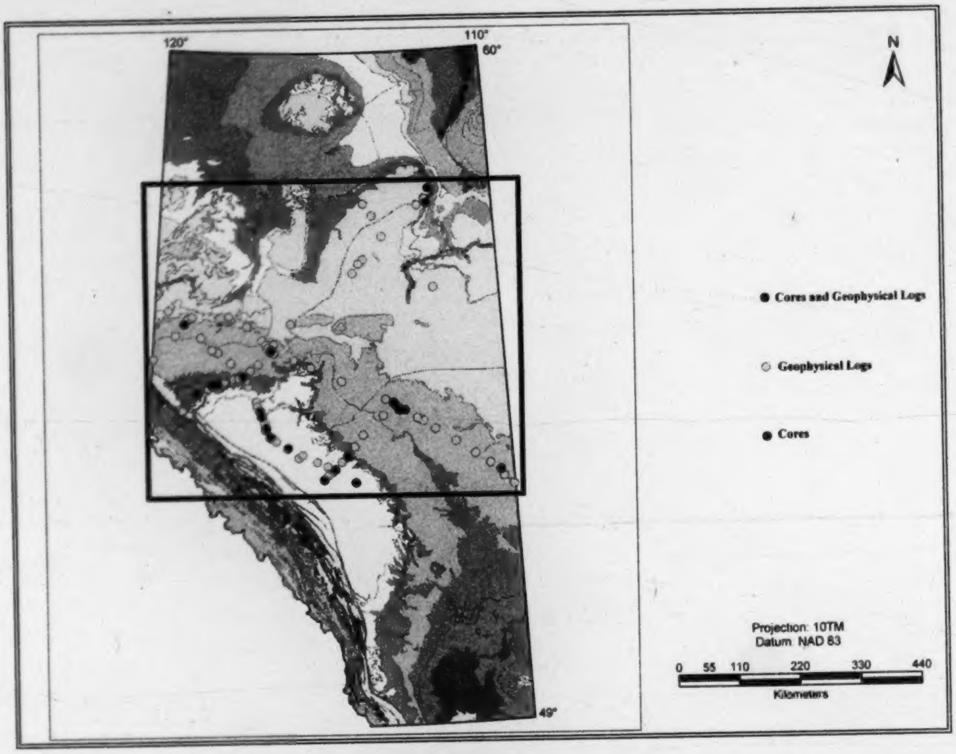
120°
110°
60°
49°
N
● Cores and Geophysical Logs
○ Geophysical Logs
● Cores
Projection: 10TM
Datum: NAD 83
0 55 110 220 330 440
Kilometers

**Figure 1.1**: Locations of core and geophysical logs for this study. Note: Yellow circles represent geophysical logs, red circles represent geophysical logs with logged core, blue circles represent logged core with no geophysical logs. The study area is outlined.

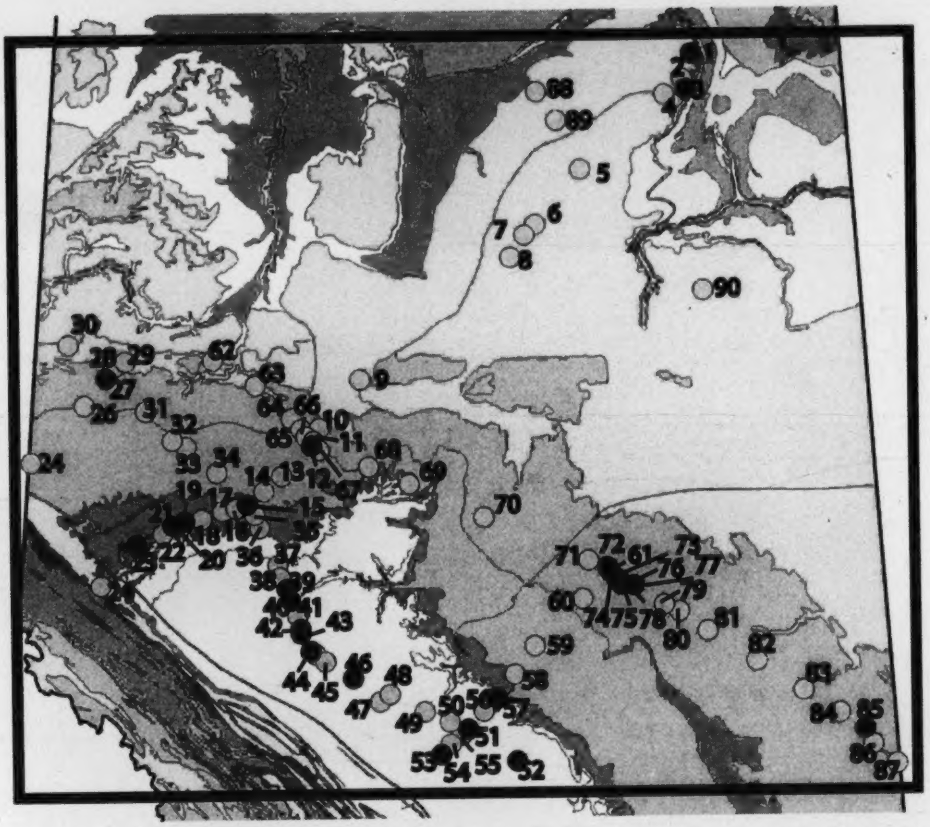

**Figure 1.2 and Table 1.1**: A close-up of the study area from Figure 1.1, with numbers assigned to each well (please refer to Table 1.1 for the unique well identifiers associated with each number).

**Table 1.1:** Unique well identifiers for each geophysical log used within this study. The numbers refer to locations in Figure 1.2. The table also indicates if the well contains a cored section.

| Location (unique well identifier): | Associated # from Figure 1.2: | Logged Core (Y/N): |
|---|---|---|
| 00/02-03-101-12W4/0 | 1 | Yes |
| 00/10-02-099-13W4/0 | 2 | No |
| 00/06-12-098-13W4/0 | 3 | Yes |
| W0/12-32-097-14W4/0 | 4 | No |
| 00/11-08-092-21W4/0 | 5 | No |
| 00/02-04-088-25W4/0 | 6 | No |
| 00/06-10-087-01W5/0 | 7 | No |
| 00/07-21-085-02W5/0 | 8 | No |
| 00/12-03-076-14W5/0 | 9 | No |

| | | |
|---|---|---|
| 00/10-08-072-17W5/0 | 10 | No |
| 00/12-12-071-18W5/0 | 11 | No |
| 00/04-02-071-18W5/0 | 12 | Yes |
| 00/10-20-068-20W5/0 | 13 | No |
| 00/14-12-067-22W5/0 | 14 | No |
| 00/10-09-066-23W5/0 | 15 | Yes |
| 00/16-34-065-24W5/0 | 16 | No |
| 00/04-27-065-25W5/0 | 17 | No |
| 00/02-01-065-27W5/0 | 18 | No |
| 02/06-30-064-01W6/0 | 19 | Yes |
| 00/07-23-064-02W6/0 | 20 | No |
| 02/16-18-064-02W6/0 | 21 | Yes |
| 00/11-28-063-03W6/0 | 22 | No |
| 00/14-28-062-05W6/0 | 23 | Yes |
| 00/16-14-059-08W6/0 | 24 | No |
| 00/11-30-068-13W6/0 | 25 | No |
| 00/06-19-073-09W6/0 | 26 | No |
| 00/16-22-075-08W6/0 | 27 | Yes |
| 00/06-20-076-07W6/0 | 28 | No |
| 00/11-06-077-06W6/0 | 29 | No |
| 00/08-03-078-11W6/2 | 30 | No |
| 00/07-11-073-05W6/0 | 31 | No |
| 00/14-01-071-03W6/0 | 32 | No |
| 00/12-19-070-01W6/0 | 33 | No |
| 00/14-20-068-25W5/0 | 34 | No |
| 00/11-18-065-22W5/0 | 35 | No |
| 00/10-16-064-22W5/0 | 36 | No |
| 00/04-23-061-21W5/0 | 37 | No |
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| 00/10-31-054-18W5/0 | 44 | Yes |
| 00/10-05-054-17W5/0 | 45 | No |
| 02/07-33-052-15W5/0 | 46 | Yes |
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| 00/10-12-050-10W5/0 | 49 | No |
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| 00/06-31-046-08W5/0 | 53 | Yes |
| 02/06-25-047-08W5/0 | 54 | No |

| | | |
|---|---|---|
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| 00/05-10-051-04W5/0 | 57 | Yes |
| 00/09-01-053-03W5/0 | 58 | No |
| 00/07-10-055-01W5/0 | 59 | No |
| 00/14-27-058-24W4/0 | 60 | No |
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| 00/03-18-069-13W5/0 | 68 | No |
| 00/16-31-067-10W5/0 | 69 | No |
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| 00/06-10-060-21W4/0 | 74 | No |
| 00/03-16-060-21W4/0 | 75 | No |
| 00/06-35-059-21W4/0 | 76 | Yes |
| 00/07-36-059-21W4/2 | 77 | No |
| 00/06-26-059-20W4/0 | 78 | Yes |
| 00/11-01-058-18W4/0 | 79 | No |
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| 00/11-14-053-11W4/0 | 82 | No |
| 00/10-31-050-07W4/0 | 83 | No |
| 00/16-35-048-05W4/0 | 84 | No |
| 00/10-22-047-03W4/0 | 85 | Yes |
| 00/01-18-046-02W4/0 | 86 | No |
| B0/07-25-044-01W4/0 | 87 | No |
| 00/11-17-098-24W4/0 | 88 | No |
| 00/06-11-096-23W4/0 | 89 | No |
| 00/15-13-082-13W4/0 | 90 | No |

### 1.3 The Colorado Group

The Colorado Group consists of a mudstone dominated package of rocks of Albian to Santonian (25 to 30 million years) age. The Group also contains sandstones, conglomerates, shaley chalk, chalky limestones, and horizons of bentonite (Leckie et al., 1994). The Colorado Group is important, in part, because it accounts for 14% of Western Canada's hydrocarbon reserves (Podruski et al., 1988; Porter, 1992). During the time of deposition of the Colorado Group, sea level maximas occurred during the Late Albian, the Early Turonian and the Middle Santonian (Caldwell, 1984, Haq et al., 1987, Leckie et al., 1994). In between these sea level rises, four regressive periods occurred, marked by the deposition of the Peace River-Viking, the Dunvegan, the Cardium-Bad Heart and the Milk River Formations. A comparative stratigraphic chart for the Colorado Group is illustrated in Figure 1.3 (Leckie et al., 1994). A basin-wide unconformity can be found at the base of the Colorado Group. The Group overlies the non-marine Mannville Group in most of the subsurface of Alberta (Leckie et al., 1994). The Milk River, Lea Park and Puskwaskau Formations conformably to disconformably overlie the Colorado Group throughout southern to northwestern Alberta (Bloch et al., 1993).

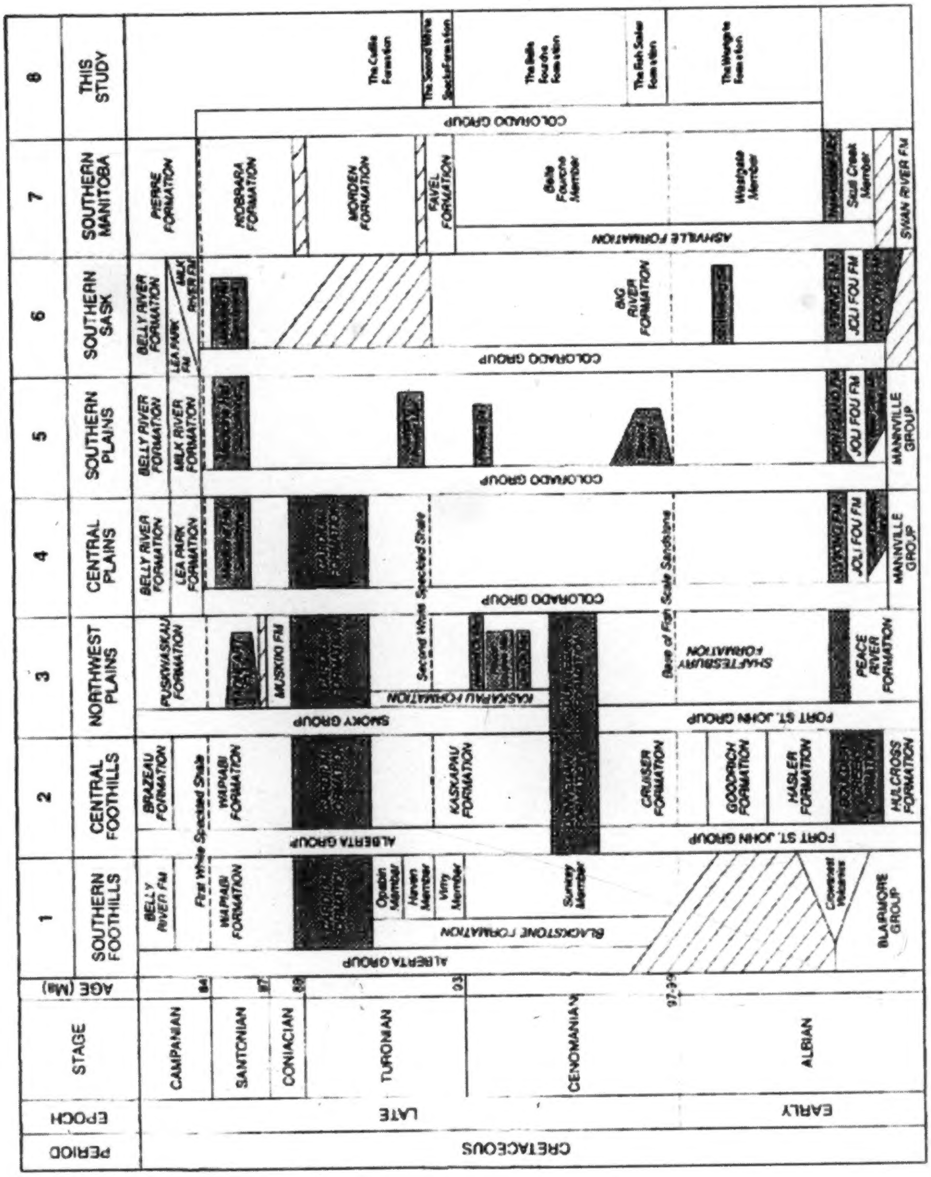
PERIOD
EPOCH
STAGE
AGE (Ma)
1 SOUTHERN FOOTHILLS
2 CENTRAL FOOTHILLS
3 NORTHWEST PLAINS
4 CENTRAL PLAINS
5 SOUTHERN PLAINS
6 SOUTHERN SASK
7 SOUTHERN MANITOBA
8 THIS STUDY
CRETACEOUS
LATE
EARLY
CAMPANIAN
SANTONIAN
CONIACIAN
TURONIAN
CENOMANIAN
ALBIAN
84
87
88
93
97-3?
BELLY RIVER FM
First White Speckled Shale
WAPIABI FORMATION
Opabin Member
Haven Member
Vimy Member
Sunkay Member
Crowsnest Volcanics
BLAIRMORE GROUP
BLACKSTONE FORMATION
ALBERTA GROUP
BRAZEAU FORMATION
WAPIABI FORMATION
KASKAPAU FORMATION
CRUISER FORMATION
GOODRICH FORMATION
HASLER FORMATION
HULCROSS FORMATION
FORT ST. JOHN GROUP
PUSKWASKAU FORMATION
MUSKIKI FM
SMOKY GROUP
KASKAPAU FORMATION
Second White Speckled Shale
Base of Fish Scale Sandstone
SHAFTESBURY FORMATION
PEACE RIVER FORMATION
BELLY RIVER FORMATION
LEA PARK FORMATION
COLORADO GROUP
JOLI FOU FM
MANNVILLE GROUP
BELLY RIVER FORMATION
MILK RIVER FORMATION
COLORADO GROUP
JOLI FOU FM
MANNVILLE GROUP
BELLY RIVER FORMATION
LEA PARK FM
MILK RIVER FM
BIG RIVER FORMATION
COLORADO GROUP
JOLI FOU FM
PIERRE FORMATION
NIOBRARA FORMATION
MORDEN FORMATION
FAVEL FORMATION
Belle Fourche Member
Westgate Member
ASHVILLE FORMATION
Skull Creek Member
SWAN RIVER FM
COLORADO GROUP
The Carlile Formation
The Second White Specks Formation
The Belle Fourche Formation
The Fish Scales Formation
The Westgate Formation

**Figure 1.3**: Stratigraphic chart for the Colorado Group for Western Canada. Stippling shows oil and/or gas production (modified from Bloch et al., 1999).

The oldest contact within the Colorado Group is represented by the basal basin-wide unconformity. The lowermost units are Albian in age. They consist of the Spinney Hill Sandstone in eastern and central Saskatchewan, the Basal Colorado Sandstone in southeastern Alberta and the marine shales of the Joli Fou Formation in other areas (Leckie et al., 1994). The younger Albian units (and equivalents) consist of the sandy Viking Formation, which is found in central and southern Alberta and Saskatchewan, the Bow Island Formation in southwestern Alberta, the Pelican Formation in northeastern Alberta and the Paddy Member of the Peace River Formation in northwestern Alberta (Leckie et al., 1994).

Many authors have not divided the Late Albian to Turonian shales. Instead, they have either left the section as a mass of Colorado Group shales, or with the name of La Biche (Leckie et al., 1994, Bloch et al., 1999). Bloch et al. (1999) have published reports which divided the Colorado Group from the Late Albian to the Middle Turonian by distinguishing four unique regionally mapable shale units that include (from oldest to youngest): the Westgate Formation, the Fish Scales Formation, the Belle Fourche Formation, and the Second White Specks Formation (see Figure 1.3). The Westgate and the Belle Fourche names came from the Ashville Formation in Manitoba. The Westgate is a shale unit that was deposited during the Late Albian. It was distinguished by a siltstone to mudstone character that was deposited close to the base of the Colorado Group (Leckie et al., 1994, Bloch et al., 1999). Disconformably overlying the Westgate is the muddy to clayey Fish Scales Zone. This condensed section was deposited during the Early Cenomanian. A basal conglomeratic layer was identified which likely represented a dramatic environmental change. The contact with the overlying Belle Fourche Formation is gradational. This Middle to Late Cenomanian unit was affected in the northwest by the progradation of the Dunvegan Formation. The final, and stratigraphically highest unit, which was described in Bloche et al., (1999), is the Second White Specks Formation that lies conformably to disconformably above the Belle Fourche Formation. The Second White Specks Formation ranges from a marlstone, to a limestone, to a shale. It was deposited in fully marine conditions (Bloch et al.,1999).

The Barons Sandstone should also be mentioned because it is Cenomanian in age and was reported by Leckie et al., (1994) to overlie the Fish Scales Zone in southern Alberta. The Big River Formation (Albian to Cenomanian) is designated in Saskatchewan as the section sandwiched between the Viking Formation and the base of the Second White Speckled Shale (Leckie et al., 1994). In northwestern Alberta, the Dunvegan Formation is a fluvio-deltaic wedge that is Middle/Upper Cenomanian in age. Above the Dunvegan is the Kaskapau Formation, which includes the Doe Creek, the Pouce Coupe and the Howard Creek members. The Kaskapau Formation also is found in northwestern Alberta. The Phillips Sandstone/Second White Speckled Sandstone seems to correspond in time, at least in southwestern Saskatchewan and southeastern Alberta, with the sandstones of the Kaskapau Formation. The Cardium Formation is a marine sand/silt/conglomerate unit, is Turonian/Coniacian in age, and is found in northwestern Alberta, the Rocky Mountain Foothills and the Interior Plains. It is disconformably overlain by Coniacian/Early Campanian marine shales and sandstones. Overlying the Cardium, in some areas, is the Muskiki Formation. It in turn is overlain by the Marshybank Formation. A regional unconformity caps the Marshybank and separates it from the overlying Bad Heart Formation which is found in the plains. The stratigraphically younger Wapiabi and Puskwasku Formations overlie the Bad Heart Formation. Finally, the First White Speckled Shale is Santonian/Campanian in age and exists the whole Western Canada Sedimentary Basin. In parts of Saskatchewan, the First White Specks unconformably overlies the Second White Specks (Leckie et al., 1994). These and more details on the Colorado Group can be found in the stratigraphic chart in Figure 1.3 and the *Geological Atlas of the Western Canada Sedimentary Basin* (Leckie, 1994).

In northeastern Alberta, the Colorado Group has an unconformity at its base, and occurs above the non-marine Manville Group. Within the Colorado Group, the stratigraphically lowest unit is the non-calcareous Joli Fou Formation marine shale, which is Albian in age (Leckie et al., 1994). The Joli Fou pinches out towards the Rockies and foothills (Glass, 1990). In addition there are the Pelican/Viking Formation sandstones of Albian age, which have a disconformable contact with the underlying Joli

Fou. These sandstones are equivalent to the Viking and Paddy Formations in other areas (Glass, 1990). Above this, the remaining shales are grouped into the La Biche Formation that comprises dark grey and brown shales that contain white speckled layers and skeletal fish material near its base (Glass, 1990). The La Biche Formation spans from Albian to the Campanian and includes the Fish Scales Zone (divides the Albian from the Cenomanian), a Colorado Shale, the Second White Speckled Shale (Cenomanian to Turonian), a Colorado Shale, the First White Speckled Shale (Santonian to Campanian) and, finally, the Lea Park, which is the youngest unit.

## 1.4 The Second White Specks Formation

The Second White Specks Formation has been described as laminated, non-bioturbated marlstones to limestones in Saskatchewan, calcareous claystone to siltstones in eastern and southern Alberta, and calcareous siltstone in northwestern Alberta. The formation is approximately 25 m thick at the Saskatchewan-Manitoba border, is less than 20 m in southern Alberta, thickens to 55 m in southwestern Alberta and thickens to over 90 m in the Peace River Arch area of northwestern Alberta (Bloch et al., 1999, Glass, 1990). Figure 1.4 illustrates some previous study areas of the Second White Specks Formation within southern Alberta by selected other workers (Stasiuk and Goodarzi 1988; Gilboy, 1988; Ridgley, 1998; and Bloch et al., 1999).

The white specks within this formation result from fecal pellets that contain coccoliths and coccospheres (Leckie et al., 1994). Pelecypod fragments, fish scales and bones, ammonites, shell fragments, Inoceramid prisms and algal cysts are some of the organic material that can be found in this speckled unit (Leckie et al. 1994, Bloch et al., 1999). Sandstone beds and bone beds may also be found along with bentonites. Bloch et al., (1999) report abundances of carbonate ranging from 0 to 88 weight percent, dolomite from 1.5 to 6.3 weight percent, framboidal pyrite from 0.0 to 7.0 weight percent, rare siderite, quartz from 2 to 52 weight percent, illite/smectite from 5 to 48 weight percent, kaolinite from 2 to 25 weight percent, K feldspar from 0 to 5 weight percent, plagioclase is less than 3 weight percent and minor to trace amounts of biotite, muscovite, chlorite, glauconite and jarosite/gypsum/anhydrite as cements filling microfractures.

The basal contact of the Second White Specks Formation is conformable in some areas of the basin and disconformable in others. Overlying the formation is a low-angle unconformity. Above this unconformity there is an unnamed non-calcareous shale and with shales also underlying the Second White Specks Formation (Glass, 1990). The Second White Specks Formation is named the Greenhorn Formation in the U.S. and the Favel Formation (Keld Member) in Manitoba. It partly correlates to the Vimy member of the Blackstone and the middle Kaskapau Formation found in northern Alberta and British Columbia (Leckie et al., 1994).

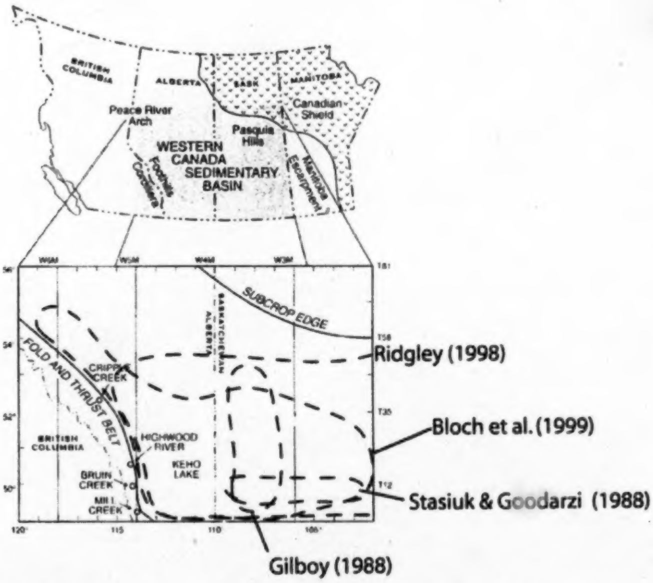
BRITISH COLUMBIA
ALBERTA
SASK
MANITOBA
Canadian Shield
Peace River Arch
Pasquia Hills
WESTERN CANADA SEDIMENTARY BASIN
Foothills Cordillera
Manitoba Escarpment
W6M
W5M
W4M
W3M
56°
54°
52°
50°
T81
T58
T35
T12
SUBCROP EDGE
SASKATCHEWAN
ALBERTA
FOLD AND THRUST BELT
CRIPPLE CREEK
BRITISH COLUMBIA
HIGHWOOD RIVER
KEHO LAKE
BRUIN CREEK
MILL CREEK
120°
115
110
105°
Ridgley (1998)
Bloch et al. (1999)
Stasiuk & Goodarzi (1988)
Gilboy (1988)

**Figure 1.4**: Map of western Canada with outlined study areas for some of the published works on the Second White Specks Formation (modified from Bloch et al., 1999).

The Second White Specks Formation is approximately 93 million years old (Haq et al., 1987, Leckie et al., 1994). This marker bed represents the division between the Turonian and Cenomanian. The age of the formation is defined by the presence of the *Hedbergella loetterlei* Zone within Alberta and represents latest Cenomanian to Middle

Turonian time (Caldwell et al., 1978). The Western interior zone fossils for the Second White Specks Formation include *Watinoceras devonense, Pseudaspidocerase flexuosum, Vascoceras birchbyi, Mammites nodosoide* and *Collingnoniceras woollgari,* and these comprise both agglutinated and planktic specimens (Bloch et al., 1999). The basal boundary of the Second White Specks Formation has been defined as the first occurrence of planktic foraminifers and coccoliths (Bloch et al., 1999).

It is generally believed that Type II marine organic matter is the dominant organic within the Second White Specks Formation (Leckie et al., 1994, Bloch et al., 1999). The total organic carbon (TOC) content reaches a maximum of 12 wt %, and this is a very high TOC content when compared to the surrounding shales (Bloch et al., 1999). Investigations by Bloch et al. (1999) have shown that the Second White Speckled Shale is a mature source rock west of 114° longitude, where the migration of hydrocarbons most likely occurred through fractures. Ibid also described the wireline log signature as exhibiting an increase in resistivity and radioactivity with a variable response in the lower part of this unit. In contrast, the upper contact has decreasing resistivity and sonic velocity. Leckie et al. (1994) also noted that due to abundant kerogen in the unit, a high uranium content exists; this is because the kerogen acts as a precipitant or 'scrubber' of uranium from circulating syngenetic, diagenetic and epigenetic waters. This enhanced uranium content, and the radiogenic daughter products, cause the spike on gamma-ray logs. The higher readings also occur due to radioactive bentonites found within the unit.

The Second White Speckled Shale was deposited in anoxic waters during the maximum transgression peak of the Late Cenomanian to Early Turonian and subsequent sea level fall during the Middle Turonian in the Cretaceous (Bloch et al., 1999). Leckie et al., (1994) stated that when the sea level was rising during the Turonian transgression, cool boreal waters were intermixing with much warmer waters from the Gulf of Mexico. Abundant fine-grained material was deposited, and coalesced into large layers of shales. This formed the basis of the Colorado Group within which the Second White Speckled Shale can be found. It has been noted that during the maximum transgression, waters warmed from 5°C to as much as 20°C north of 54°N latitude (McNeil and Caldwell,

1981) because warm Tethyan waters penetrated northward into the cool Boreal waters (Bloch et al., 1999). This may explain why both benthic and planktonic foraminiferas can be found in the Second White Specks Formation.

## 1.5 Regional Tectonics and Depositional History

During the Late Cretaceous in Western Canada, the Western Canada Sedimentary Basin was forming a foreland basin, with tectonic loading occurring to the west (Leckie and Smith, 1992). The sediments that were deposited during the time the Colorado Group was being created in a wedge shaped geometry, measured approximately 700 m in thickness in southwestern Alberta, 200 m in the Manitoba Escarpment, and more than 1500 m in the Peace River Arch area, which was subsiding during this time (Leckie et al., 1994). The Colorado Group sedimentation, therefore, took place while the foreland basin was tectonically active and is illustrated in Figure 1.5 below. Even though abundant sediment was deposited, during maximum transgression, the sea level only reached 200 to 300 m in depth (Leckie and Smith, 1992).

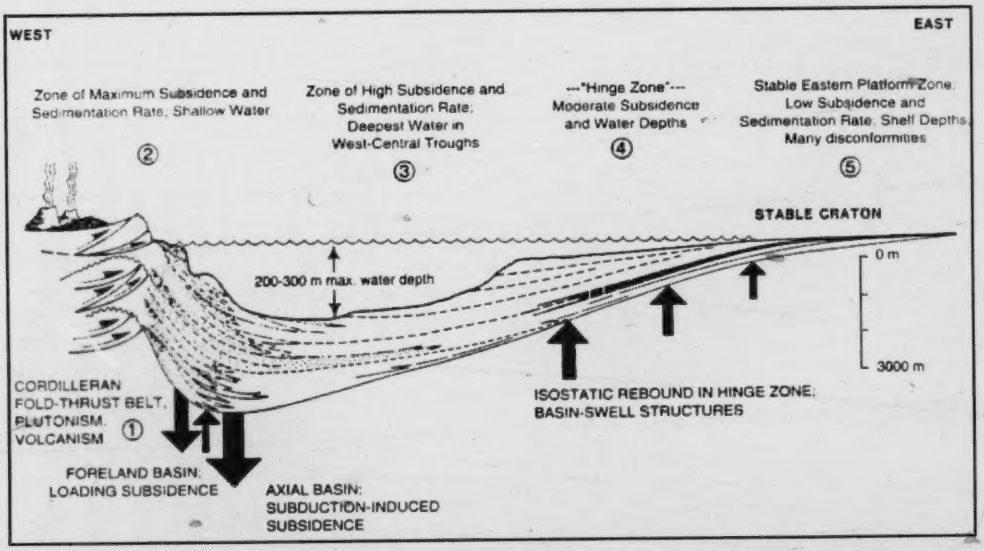
WEST
EAST
Zone of Maximum Subsidence and Sedimentation Rate, Shallow Water
②
Zone of High Subsidence and Sedimentation Rate; Deepest Water in West-Central Troughs
③
---"Hinge Zone"--- Moderate Subsidence and Water Depths
④
Stable Eastern Platform Zone, Low Subsidence and Sedimentation Rate, Shelf Depths; Many disconformities
⑤
STABLE CRATON
200-300 m max. water depth
0 m
3000 m
CORDILLERAN FOLD-THRUST BELT, PLUTONISM, VOLCANISM
①
ISOSTATIC REBOUND IN HINGE ZONE; BASIN-SWELL STRUCTURES
FORELAND BASIN: LOADING SUBSIDENCE
AXIAL BASIN: SUBDUCTION-INDUCED SUBSIDENCE

**Figure 1.5**: Schematic representation of the Western Canada Sedimentary basin during maximum transgression. The arrows represent thrusting, subsidence and uplift (from Leckie and Smith, 1992).

## 1.6 Previous Work

Work by Fraser et al., (1935) initially identified the Second White Speckled Shale in a survey of southern Saskatchewan in the 1930s. This survey covered southern Alberta and all of the Cretaceous strata were discussed. Fraser (Ibid) noted that a dark shale with white specks existed in the subsurface and could be traced across the basin into Alberta. There was no type locality designated at that time, but more recently, a stratotype section for the Second White Specks Formation was listed as the Amoco B-1 Youngstown 6-34-30-08W4 well (Bloch et al., 1999).

Bloch et al.'s (1999) work is one of the more recent publications that summarize the Colorado Group and its stratigraphic subdivisions. This Geological Survey of Canada (GSC) Bulletin (Ibid) addressed several cores and outcrops that exist in southern Alberta and Saskatchewan, and proposed a subdivision for the Colorado Group shales that includes the Westgate, the Fish Scales, the Belle Fourche and the Second White Specks formations. This (Ibid) very detailed work also covered paleoenvironments, mineralogy, stratigraphy, geochemistry, paleontology and the geological history of all the newly named formations. The *Geological Atlas of the Western Canada Sedimentary Basin* (Mossop and Shetsen, 1994) devotes a whole chapter to the Colorado Group/Alberta Group and its inclusive formations and members. It (Ibid) provides a comprehensive geological history and stratigraphy of the Group. The sedimentology and depositional history of the Second White Speckled Shale is addressed by Leckie et al. (1994) who describe the Formation as being both a source and reservoir rock. Basin wide cross sections for the Group are included in Leckie et al. (Ibid) and reveal the wedge-shaped geometry of the Colorado Group, which thins towards the northeast of Alberta. The chapter by Leckie et al. (Ibid) also illustrates geophysical log signatures expected for the various formations within the Colorado Group across Alberta.

An Alberta Energy and Utilities Board/Alberta Geological Survey (EUB/AGS) publication, by Dufresne et al. (2001) was the impetus for this thesis. This publication (Ibid) investigated the detailed geochemistry of the Second White Speckled Shale, amongst other units, such as the Fish Scales Formation and the Shaftesbury Formation. It detailed work performed in northern Alberta, and indicated the Second White Speckled Shale has anomalous base metal concentrations, high total organic carbon content, and some anomalous diamond indicator minerals (Dufresne et al., 2001). In particular, the Second White Specks Formation in the Birch Mountains area (northeastern Alberta) returned anomalous to, in places, very high concentrations of one or more of: Au, Pt, Pd, Ag, Sb, As, Cu, Zn, Cd, Co, Ni, V, Mo, Fe, Mn, Ba, Ca, Br, Se, U, Eu, Ce, La, Lu, Nd, Sm, Tb, Y, Yb, S and total organic carbon (Dufresne et al., 2001). Figure 1.6 illustrates the median of various elements from the Second White Specks Formation, the Fish Scales Formation, the Westgate Formation and the Loon River Formation, and demonstrates that in that study, the Second White Specks Formation often shows the highest median.

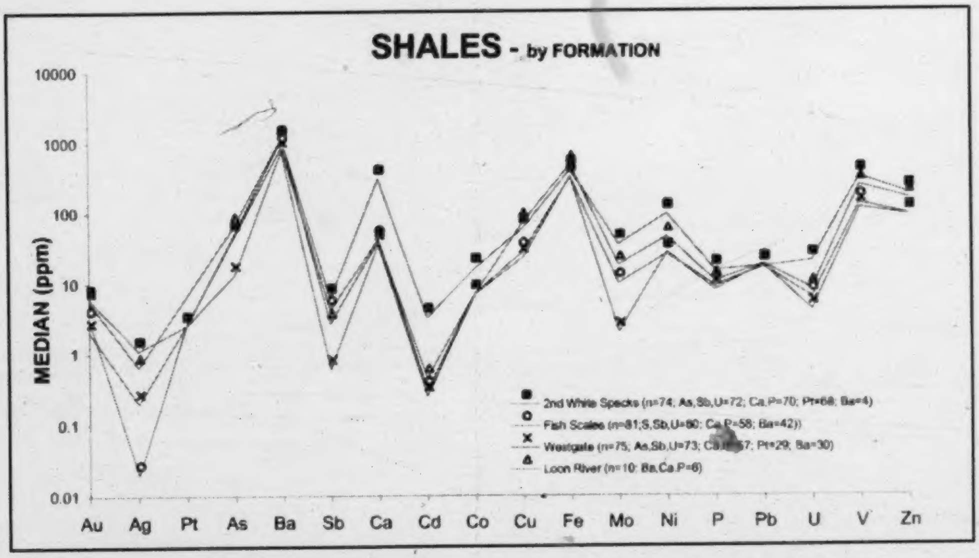

**Figure 1.6** Graphical representation of the median for the various elements in the study by Dufresne et al., 2001. Notice that the Second White Specks Formation (represented by the square symbol) tends to consistently show higher median values for most elements compared to the Fish Scales, Westgate and Loon River formations (from Dufresne et al., 2001).

Other works that describe the geochemistry of the Second White Specks Formation include recent work by Travis (2002). This (Ibid) report covers the organic geochemistry of the Formation, as well as the geochemistry of the Belle Fourche Formation. In her (Ibid) analyses Travis demonstrates that the Second White Specks Formation has a high total organic carbon content, Type II kerogen, early maturity and fair to very good hydrocarbon potential in central/western Alberta (west of Edmonton). Six Second White Specks Formation cores and two Belle Fourche Formation cores were studied and sampled by Travis (Ibid), who concluded that both Formations have potential for shale gas production. An article on the organic petrology of the Second White Speckled Shale within Saskatchewan indicated that the shale is thermally immature in that area (Stasiuk, 1988). It (Ibid) also suggested that there may be a link within the shale between bituminite and biogenic gas. As well in southwestern Saskatchewan, an investigation of the geology and natural gas production from the Second White Speckled Shale showed that it can also be a reservoir for sweet, dry, biogenic gas (Gilboy, 1987, Gilboy, 1988). Gilboy's article (s) (Ibid) also described the Second White Specks lithologically, dividing the unit into subunits, and describing the depositional environment of each unit. Snowdon (1995) described in a detailed way, the rock-eval thermal maturation parameter $T_{max}$ suppression of the Second White Specks Formation, and stated that below 453°C the suppression is around 1°C for each increase in the hydrogen index of 50 mg hydrocarbon/g total organic carbon content. Issler et al. (2002) developed a method to determine organic carbon content from well logs. The study (Ibid) dealt with the Colorado Shales and used core petrophysical and geochemical data. Porosity characteristics of shales, from the southern section of the Western Canada Sedimentary Basin, have also been investigated (Katsube, 1998). Some of the characteristics of the Colorado Group included extremely tight and well compacted lithologies in places (Katsube, 1998).

Seismic profiling in central Alberta suggested the influence of the basement rocks on the overlying sedimentary cover, of which the Second White Specks Formation is included (Milkereit et al., 1995). A compilation by Pana et al. (2001) using Geographical Information Systems shows the known and inferred structural elements (i.e., faults) in northern Alberta, and also discusses the fault zone and tectonic elements that were active during the Cretaceous. Other works on the structures within the Western Canada Foreland

Basin during the Cretaceous are those by Leckie and Smith (1992) and Kauffman and Caldwell (1993). These studies (Ibid) discuss the processes inherent during basin formation, including paleoenvironments, depositional and sea level cycles throughout the Cretaceous. As well, Kauffman (1984) outlined some changes in the environment throughout the Cretaceous in the Western Interior Seaway; these included a warming period, normalization of salinity and changes in oxygenated/anoxic waters during the time of peak transgression (i.e., during the time the Second White Speckled Shale was reportedly deposited – see Figure 1.7). Glancy et al. (1993) produced a paleoclimate model of warm weather and periods of humidity for the North American sea during the Cretaceous (specifically from the Cenomanian-Turonian). Kauffman (1977) provided an overview of the Western Interior Cretaceous Basin in a field trip guide across the Basin in which he described the tectonics, geochronology, sedimentation patterns, organisms and paleoclimate during this time frame (as for example shown in Figure 1.5). One of the broadest discussion of the entire Mesozoic was by Haq et al. (1987) who outlined the sequence stratigraphy, the magnetostratigraphy, the chronostratigraphy, the biostratigraphy and, finally, the eustatic sea level curves since the Triassic.

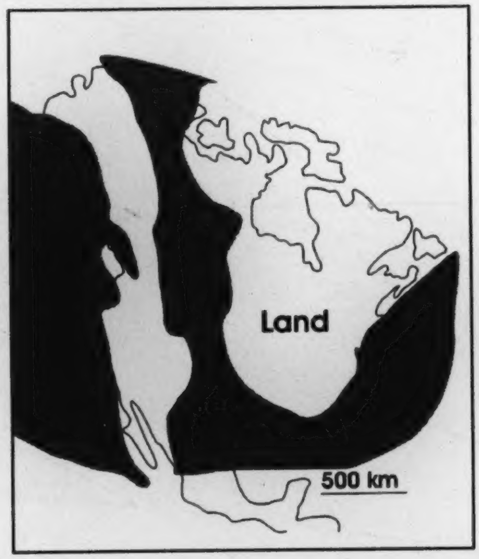

**Figure 1.7**: The Western Interior Seaway during the deposition of the Second White Specks Formation. The sea is shown for Canada, the United States and northern Mexico. Note that during this time, the warm southern Tethyan waters have intermixed with the northern cool Boreal waters (from Travis, 2002).

There are many published articles that describe the biostratigraphy (usually using foraminifera) and paleogeography of the Colorado Group or its time equivalent units. For example, Lang and McGugan (1988) described the Albian to Turonian in northern Montana and southern Alberta, close to the Sweetgrass Arch area; they combined biostratigraphy and lithology in order to propose a paleogeographic model. Schröder-Adams et al. (1996) described paleoenvironmental changes for the Colorado Group Shales based on microfossil, sedimentological and geochemical evidence. Some other scientists, such as Kauffman (1967), Eicher (1967,1969), Kent (1967, 1969), Jeletzky (1968) and Caldwell et al. (1978), also have defined biostratigraphic zones within the Cretaceous. Wall (1963) described micro- and mega-faunal assemblages for the Alberta Group (the time equivalent of the Colorado Group) and related these to possible environments of deposition. Caldwell (1982) combined the various lines of evidence with radiometric dating in order to record the Cretaceous Seaway's history, which also was described by Lang and McGugan, (1988).

Furthermore, articles such as those on the Lower Kaskapau Formation (Wallace-Dudley and Leckie, 1993), the Dunvegan, the Shaftesbury and the Kaskapau Formations (Bhattacharya and Walker, 1991), and the Lower Kaskapau and the Dunvegan Formations (Plint, 2000), described units that either are time-equivalent or close in age to the Second White Specks Formation/Colorado Group Shales.

Therefore, the present study is intended to build on the work of these previous authors, but more specifically aims to investigate the Second White Specks Formation across Alberta from a sedimentological, stratigraphical and, especially, a geochemical point of view.

## 1.7 Objectives

The key objectives of this thesis are:

- To investigate the sedimentology, stratigraphy and basin wide distribution of the Second White Specks Formation.
- To investigate the geochemistry of the unit on a regional scale.
- Lastly, to assess its potential as a host rock for sedimentary exhalative (Sedex) base-precious metal deposits.

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## 2.0 Methodology:

This study was intended to answer the following questions:

- What are the regional to local geochemical variations within the Second White Speckled Shale, and are there potentially localized metal concentrations?
- Is the Second White Specks a potential host unit for a sedimentary exhalative deposit?
- Is there a physical or geochemical change, or both, in the unit in central and northern Alberta as compared to previous studies in southern Alberta?
- How does the Second White Specks fit into a stratigraphic and depositional model on a regional scale?

The methods used to achieve the answers to these questions include the use of geophysical logs to produce cross sections, supplemented by logged core, whole rock geochemistry; as well, relative dates have been obtained using palynology and micropaleontology.

### 2.1 Methods

Geophysical logs of both gamma ray and resistivity were used in this study. The gamma ray log was chosen to build regional cross sections because it best represents the changes in grain size and the presence of bentonites within and proximal to the Second White Speckled Shale. The resistivity log varies much more within the Second White Specks Formation than the underlying and overlying units (Bloch et al., 1999), and thus was useful in this study in conjunction with the gamma ray log to evaluate lithostratigraphic variations within the unit.

### *2.1.1 Accumap and Cross Sections*

The search for the Second White Specks Formation was performed using Accumap by searching for "Second White Specks" and "core", then by identifying whether or not the pick was correct and contained a shale or sand package. Approximately 34 cores in the Study Area contained the "Second White Specks" and a reasonable amount of cored sections. Difficulties were encountered with this search because the Belle Fourche Formation was not picked in any of the cored sections within the study area. This, in turn, made the base of the Second White Specks Formation difficult to pick, and hence the distinction between the Second White Specks shale, the Belle Fourche shale and the Fish Scales was often extremely difficult with just the initial geophysical logs from Accumap (see Figure 2.1).

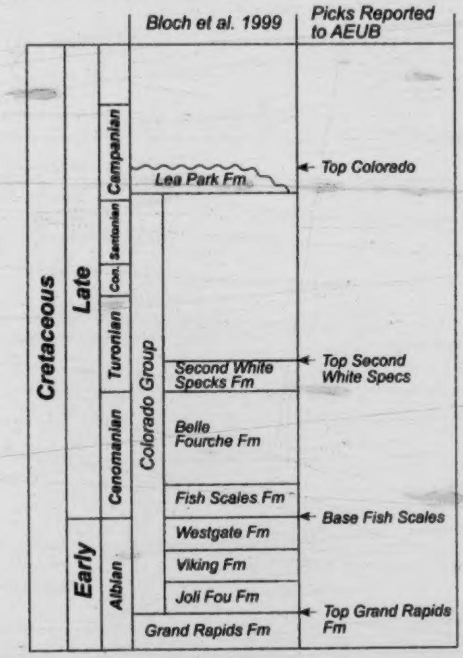
Bloch et al. 1999
Picks Reported to AEUB
Cretaceous
Late
Early
Campanian
Santonian
Con.
Turonian
Cenomanian
Albian
Colorado Group
Lea Park Fm
Second White Specks Fm
Belle Fourche Fm
Fish Scales Fm
Westgate Fm
Viking Fm
Joli Fou Fm
Grand Rapids Fm
Top Colorado
Top Second White Specs
Base Fish Scales
Top Grand Rapids Fm

**Figure 2.1:** Chart illustrating the picks that are reported to the Alberta Energy and Utilities Board (AEUB) for the Colorado Group. This demonstrates the difficulty in identifying the Second White Specks Formation from other shales within the Colorado Group using only the picks from Accumap for the Colorado Group (adapted from Stancliffe et al., 2003).

The lines of cross section were chosen to be of maximum extent across the study area, and appropriate geophysical logs were chosen along these lines of section (see Figure 1.2). A sequence stratigraphic approach was then applied to the cross sections in order to correlate the wells. Three are dip sections and three are strike sections. These are composed of some logged cores, supplemented by geophysical logs, which fills in the gaps between the logged cores.

### *2.1.2 Logging Core*

Selected core at both the Calgary and Edmonton EUB core facilities were logged during the summer of 2003. These were logged box by box, from the top of the interval to the base. Some aspects that were logged include: grain size and grain size changes, bentonite horizons, changes in reaction to hydrochloric acid, the presence of fossils, colour changes, presence/absence of 'white specks', sedimentary structures and any sulphides present. A detailed logging form was filled out and inserted into Powercore software so that all information could be catalogued. Samples were collected from the cores at a 1m interval, marked and placed in a cloth bag. The logging forms are included in their entirety in Appendix 6.1.

### *2.1.3 Palynology*

Shale was ubiquitously encountered in the cores and as a result, formation contacts could be difficult to place when there was no readily apparent change in physical characteristics in the core. Thus positive identification using only the physical characteristics of the formations became impossible for some of the cores. Therefore, dating (using micropaleontology and palynology) of each core became necessary to try and ensure that the interval of core contained the Second White Specks Formation. If dates could not be identified using micropaleontology, as was the case for the cores from the Birch Mountains in northeastern Alberta, samples were subsequently sent in for palynology dating.

According to Mr. Dolby, Calgary (personal communication, 2004), "About 20g of the rock sample is crushed to 3 mm fragments (lentil-split pea size) and heated with concentrated HCl to remove any carbonates. It is then washed in distilled $H_2O$ and 70% HF is added to dissolve the silicates. The residual HF is removed by repeated dilution with distilled $H_2O$ and centrifugation. The residue is then treated with hot HCl to remove any fluorides and then washed again. The undigested mineral matter is removed by heavy liquid separation using ZnCl. The float (kerogen) is removed and a small amount is made into a kerogen slide by dispersing it in PVA on a cover-slip which, after drying is mounted onto a microscope slide using a two-part resin. The remaining kerogen is sieved using a 10 micron sieve and another slide is made. The kerogen is then oxidized using either concentrated $HNO_3$ or Schultz's Solution ($HNO_3$ + $KClO_3$) washed by sieving at 10 microns, stained using Safranin and another slide is made. The stained slide is systematically scanned and the palynomorphs counted to obtain abundance data for the different species. The slides of unoxidized material are used for kerogen analysis if required." The palynology results are tabulated in Appendix 6.3.

### *2.1.4 Micropaleontology*

To extract the foraminifera from the sediment, the samples were crushed using Then and Dougherty's (1983) method (Dr. Claudia Schröder-Adams at Carleton University, personal communication, 2004). The samples were then sieved and the residual material was picked for foraminifera. The micropaleontology results are tabulated in Appendix 6.2.

### *2.1.5 Geochemistry*

#### *2.1.51 Sample Collection Procedures*

In total, 730 samples were collected from 24 cores from the Energy and Utilities Board (EUB) Calgary Core Research Center and the Edmonton Minerals Core Research Facility during the summer of 2003. The core was sampled at 1 m intervals and additional samples were taken primarily for micropaleontology, bentonites and any thin section work. Samples typically were collected over a length of 1 to 7 cm, and a width of 2.5 cm from the outer edge of the core. Thus, the geochemical samples represent 'short' intervals (i.e., essentially 'spot sampling') rather than being across the entire 1 m interval; this was done due to sampling limitations, imposed by the EUB core facilities. In some cases, the core could not be removed by hand. Where appropriate, it was subsequently labeled and sawed by the Calgary Core Research Facility. The samples were labeled immediately and inserted into separate cloth bags. These were stored until shipment to the laboratory for analysis in December 2003 and March 2004.

### *2.1.52 Sample Preparations*

The geochemical rock samples were sorted and detailed in a Microsoft Excel spreadsheet as tabulated in Appendix 6.4. Due to budget constraints, not all of the samples could be analyzed. Some of the samples, therefore, had to be eliminated based on the probability of the core representing, or not, the Second White Specks Formation. The end result was that 556 selected samples were sent for analysis, along with 36 duplicates and 18 standards. Of the 556 samples, 540 were sent for the 1F package (the other 16 only sent for the more rigorous package along with 68 samples from the 540 samples which were also sent for the 1F package to make up the 84 samples described) and 84 of the samples from 5 cores: 00/10-22-047-03W4/0, 00/14-29-048-06W5/0, 00/06-31-046-08W5/0, 00/05-10-051-04W5/0, 00/02-03-101-12W4/0 (7BK03), were sent for near total major oxides, trace elements, total C, organic C, CO2, S and SO4. These 5 cores were chosen due to the fact that they represented the most complete sections of the Second White Specks Formation in north-eastern Alberta, eastern Alberta and the deep basin in west-central Alberta. The samples which were analyzed were sent to the laboratory in their original bags. The bags were collected into bundles and packaged in large plastic containers, then sent to the laboratory in Vancouver.

### *2.1.53 Analytical Procedures*

The following procedures are from ACME Labs (J. Gravel, personal communication, 2004).

Group 1F: Ultratrace by Induction Coupled Plasma - Mass Spectrometer (ICP-MS) Analysis:

Steps include:

Sample Preparation:

1) The samples are dried at 60°C.
2) The sediment is sieved to -80 mesh (-177 μm)
3) Rock fragment and core are jaw crushed to 70 % passing 10 mesh (2 mm), then a 250 g riffle split is pulverized to 95 % passing 150 mesh (100 μm) in a mild-steel ring-and-puck mill.
4) Pulp splits of 1 g are weighed into test tubes.

Sample Digestion:

1) An aqua regia solution of equal parts concentrated ACS grade HCl and $HNO_3$ and de-mineralized $H_2O$ is added to each sample (6mL/g).
2) The samples are leached in a hot water bath (~95°C) for one hour.
3) Once cooled, the solution is made up to a volume with 5% HCl. Sample weight to solution volume ration is 1 g per 20 mL.

Sample Analysis:

The solutions are aspirated into a Perkin Elmer Elan 6000 ICP mass spectrometer. Concentrations were determined for 53 elements (Ag, Al, As, Au, B, Be, Ba, Bi, Ca, Cd, Ce, Co, Cr, Cs, Cu, Fe, Ga, Ge, Hf, Hg, In, K, La, Li, Mg, Mn, Mo, Na, Nb, Ni, P, Pb, Pd, Pt, Rb, Re, S, Sb, Sc, Se, Sn, Sr, Ta, Te, Th, Ti, Tl, U, V, W, Y, Zn, Zr).

Group 1EX: 4 Acid Digestion:

Steps include:

Sample Preparation:

1) The samples are dried at 60°C.
2) The sediment is sieved to -80 mesh (-177 μm).
3) Rock fragment and core is jaw crushed to 70 % passing 10 mesh (2 mm), then a 250 g riffle split is pulverized to 95 % passing 150 mesh (100 μm) in a mild-steel ring-and-puck mill.

4) The pulp splits of 0.25 g are weighted into Teflon test tubes.

Sample Digestion:

1) A 10 mL aliquot of acid solution (2:2:1:1 $H_2O$-HF-$HClO_4$-$HNO_3$) is added, heated until fuming on a hot plate and then taken to dryness.
2) A 7.5 mL aliquot of 50 % HCl is added to the residue and heated in a hot water bath (~95°C) for 30 minutes.
3) The solutions cool and are moved to polypropylene test-tubes and made to a 10 mL volume with 5 % HCl.

Sample Analysis:

The solutions are aspirated into a Perkin Elmer Elan 6000 ICP mass spectrometer. Concentrations were determined for 41 elements (Ag, Al, As, Au, Ba, Be, Bi, Ca, Ce, Cd, Co, Cr, Cu, Fe, Hf, K, La, Li, Mg, Mn, Mo, Na, Nb, Ni, P, Pb, Rb, S, Sb, Sc, Sn, Sr, Ta, Th, Ti, U, V, W, Y, Zn, Zr).

Group 4A: Whole Rock Analysis by Induction Coupled Plasma – Emission Spectrometer:

Steps include:

Sample Preparation:

1) The samples are dried at 60°C.
2) The sediment is sieved to -80 mesh (-177 µm).
3) Rock and drill core is jaw crushed to 70 % passing 10 mesh (2 mm), then a 250 g riffle is pulverized to 95 % passing 150 mesh (100 µm) in a mild-steel ring-and-puck mill.

Sample Digestion:

1) A 0.2 g sample aliquot is weighed in a graphite crucible and mixed with 1.5 g of $LiBO_2$ flux.
2) The sample is heated in a muffle furnace for 15 minutes at 1050°C.
3) The mixture is removed and immediately poured into 100 mL of 5 % $HNO_3$ (ACS grade nitric acid in de-mineralized water).
4) The solution is shaken for 2 hours, then an aliquot is poured into a polypropylene test tube.

5) Calibrated standards, verification standards and reagent blanks are added to the sample sequence.

Sample Analysis:

1) Sample solutions are aspirated into an ICP emission spectrometer (Jarrel Ash Atomcomp Model 975). Concentrations were determined for 11 oxides ($SiO_2$, $Al_2O_3$, $Fe_2O_3$, CaO, MgO, $Na_2O$, $K_2O$, MnO, $TiO_2$, $P_2O_5$, $Cr_2O_3$), LOI and 5 elements (Ba, C, Ni, S, Sc).
2) A 1 g sample split is ignited for 90 minutes at 950°C, cooled in a dessicator, then weighed with the difference expressed as percent Loss on Ignition (%LOI).
3) A 0.1 g sample split is analyzed for total Carbon and Sulphur by the LECO method.

Group 4B: Whole Rock Trace Elements by ICP-MS:

Steps include:

Sample Preparation:

1) The samples are dried at 60°C.
2) The sediment is sieved to -80 mesh (-177 μm).
3) Rock and drill core is jaw crushed to 70 % passing 10 mesh (2 mm), then a 250 g riffle split is pulverized to 95 % passing 150 mesh (100 μm) in a mild-steel ring-and-puck mill.

Sample Digestion:

1) A 0.2 g sample aliquot is weighed into a graphite crucible and mixed with 1.5 g of $LiBO_2$ flux.
2) The sample is heated in a muffle furnace for 15 minutes at 1050°C.
3) The mixture is removed and immediately poured into 100 mL of 5 % $HNO_3$ (ACS grade nitric acid in de-mineralized water).
4) The solution is shaken for 2 hours then an aliquot is poured into a polypropylene test tube.
5) Calibration standards, verification standards and reagent blanks are added to the sample sequence.

Sample Analysis:

1) Sample solutions are aspirated into an ICP mass spectrometer (Perkin-Elmer Elan 6000). Concentrations were determined for 29 elements (Ce, Co, Cs, Dy, Er, Eu, Ga, Gd, Hf, Ho, La, Lu, Nb, Nd, Pr, Rb, Sm, Sn, Sr, Ta, Tb, Th, Tm, U, V, W, Y, Yb, Zr).

Group 2A: Total Carbon and Sulphur:

Steps include:

Sample Preparation:

1) The samples are dried at 60°C.
2) The sediment is sieved to -80 mesh ASTM (-177 μm).
3) Rocks and drill core is crushed and pulverized to -150 mesh ASTM (-100 μm).
4) Sample splits (0.1 g) are placed in Leco crucibles.

Sample Analysis:

1) After precise weighing, induction flux is added and the sample is ignited at >1650°C in an induction furnace.
2) A carrier gas sweeps up released carbon and sulphur to be measured by adsorption in an infrared spectrometric cell.
3) Results are total and attributed to the presence of carbon and sulphur in all forms. Analysis is by infrared adsorption using Leco C244 Carbon-Sulphur analyzer.
4) Organic carbon is calculated using the total carbon minus the graphite carbon and carbonate.

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# 3.0 THE STRATIGRAPHY AND SEDIMENTOLOGY OF THE SECOND WHITE SPECKS FORMATION, NORTH/CENTRAL ALBERTA

## 3.1 Introduction

The Second White Specks Formation has been described as both a source and reservoir rock by Leckie et al., (1994) and has therefore been studied extensively in Saskatchewan and southern Alberta. However, little work has been done to further delineate the sedimentology and stratigraphy of the unit in central and northern Alberta. As a result, this is one of the primary focuses of this chapter.

The Second White Specks unit ranges from a calcareous claystone/siltstone with a thickness of 20 m in southern Alberta, to a calcareous siltstone with a thickness greater than 90 m in northwestern Alberta (Bloch et al., 1999, Glass, 1990). The name of the unit came from an old driller's term for a unit they encountered with white specks within a dark grey shale; these were subsequently identified as fecal pellets that contain coccoliths and coccospheres (Leckie et al., 1994). As well, other organic matter has been observed in the Second White Specks formation; this includes *Inoceramus*, fish debris, ammonites, bone beds and algal cysts (Leckie et al. 1994, Bloch et al, 1999). In places, bentonites have been reported along with sandstone beds (Bloch et al., 1999). Finally, Bloch et al. (1999) has also described carbonate, dolomite, pyrite, quartz, illite/smectite, kaolinite, K feldspar, plagioclase, biotite, muscovite, chlorite, glauconite and minor amounts of siderite within the formation in southern Alberta cores.

The Second White Specks Formation is approximately 93 million years old and spans the end of the Cenomanian into early Turonian (Haq et al., 1987, Leckie et al., 1994). The dating of the Colorado Group in the Western Canada Sedimentary Basin has often been by microfossils and the Second White Specks is defined within Alberta by the presence of the *Hedbergella loetterlei* Zone which represents latest Cenomanian to Middle Turonian times (Caldwell et al., 1978). The lower boundary of the Second White

Specks Formation is described by the first occurrence of planktic foraminifers and coccoliths (Bloch et al., 1999).

The deposition of the Second White Specks Formation occurred during the maximum transgression of the Late Cenomanian/Early Turonian shallow sea (Bloch et al., 1999). Leckie et al. (1994) noted that when the sea level was rising during the late Cenomanian to Turonian transgression, cool boreal waters were intermixing with much warmer waters from the Gulf of Mexico, warming the sea water from 5°C to as much as 20°C north of 54°N latitude (McNeil and Caldwell, 1981). This is the reason why both benthic and planktonic foraminiferas can be found in the Second White Specks Formation (Bloch et al., 1999).

The Second White Specks Formation contains varying grain sizes from clay to sand size, with most sediments very fine grained, with small laminations of silty-sandy grains which may have been deposited via contour currents. Documented studies have shown that contour currents may carry and deposit sediments even in very shallow seas, like in the case of the Second White Specks Formation. Very weak currents have been recorded in the Yellow Sea/East China sea, which average less than 200m in depth with a low slope (less than 1°C) and transport fine grained sediments (Johnson and Baldwin, 1996). Variations in temperatures and winds cause muds to be deposited during cold southward-flowing currents and sandy zones from warm northward flows (Ibid).

The following sections of this chapter cover the depositional environment of the Second White Specks Formation during the Cenomanian and Turonian, as well as the basin scale processes by which it was deposited within Alberta. To assist with interpreting the depositional environment in central and northern Alberta, selected core across the study area were collected and logged for details such as grain size changes, sedimentary structures, presence of fossils, reaction with hydrochloric acid and mineral content. The presence of contourites is also discussed, using observations from the logged core. Finally, selected core was also analyzed for micropaleontology and palynology dates and the results are presented below.

On a much larger scale, the basin scale processes are then discussed. Basin wide cross sections (3 along dip, 3 along strike) are included; these incorporate the logged core and their geophysical logs, with additional geophysical logs along the lines of section. The variations in thickness are discussed and all of the data are put into a sequence stratigraphic context.

## 3.2 Micropaleontology

### *3.2.1 Background*

The overlying Carlile Formation, the Second White Specks Formation and the underlying Belle Fourche Formation are all shales that can be difficult to distinguish one from the other using only the physical characteristics logged from the core. This was especially true when no definite upper or lower contacts for the Second White Specks Formation were obviously present in the core. It was therefore necessary to apply dating techniques to try to distinguish the relative ages of the sediment in each core.

The samples sent for micropaleontology analysis spanned the study area. Problems in micropaleontology dating can arise, however because the differences in depth of burial can affect the preservation of calcium carbonate, and as well, the depositional rates and diagenetic dissolution can affect the amounts of calcareous organic debris (Schröder-Adams, unpublished data, 2004).

The following points list some of the micropaleontological characteristics expected of each formation according to Schröder-Adams (unpublished data, 2004).

- Fish Scales Formation: barren of foraminifera; abundant algal cysts and phosphatic debris

- Belle Fourche Formation: areas barren of benthic organisms; species present include *Verneuilinoides perplexus*

- Second White Specks Formation: characterized by planktic foraminifera, nannofossils, *Inoceramus*, lack of benthic foraminifera; *Heterohelix globulosa* and *Hedbergella spp* found in low numbers

- Carlile Formation: usually barren of foraminifera; agglutinated species in the upper part of the Formation

All micropaleontology samples were analyzed and described by Claudia Schröder-Adams of Schröder Paleo Consulting; the details are included in Appendix 6.2 and results are summarized in the following section.

### *3.2.2 Micropaleontology Results*

Cores that were confirmed to contain an interval of Second White Specks Formation include: 00/06-26-059-20W4/0, 00/16-12-046-03W5/0, 02/07-33-052-15W5/0, 00/09-09-056-19W5/0, 00/10-28-059-20W5/0 and 00/10-36-060-22W4.

The first core was confirmed 00/06-26-059-20W4/0 based on the presence of *Inoceramus* and planktonic foraminifera; the core samples are described in detail in Appendix 6.2. Because of a lack of benthic foraminifera within the samples from this core, there is strong paleontological evidence that the bottom waters were fairly anoxic and inhospitable to the benthic foraminifera. This is compatible with a highstand during the time of deposition (Claudia Schröder-Adams, results reported in Appendix 6.2).

Core 00/16-12-046-03W5/0 was also confirmed to be the Second White Specks Formation due to the presence of planktic and agglutinated foraminifera.

Two samples were sent for analysis from core 02/07-33-052-15W5/0. The basal sample, from 1964 m depth, showed a lack of planktic foraminifera and was therefore placed in the Upper Belle Fourche (Bloch et al., 1999). However, a sample from 1955 m depth, which is 9 m stratigraphically above the first sample, indicated it is the Second White Specks Formation due to the presence of planktic foraminifera species. The second sample was therefore placed near the maximum flooding surface (Appendix 6.2; this is discussed further in the following sections).

Samples of core from 00/09-056-19W5/0 and 00/10-28-059-20W5/0 were confirmed as the Second White Specks Formation due to the presence of planktic foraminifera.

The final core, 00/10-36-060-22W4/0, was confirmed as the top of the Second White Specks Formation and the base of the Carlile Formation because of the presence of *Inoceramus* shells and the species of benthic foraminifera indicate the environment was returning to improved benthic condition.

Core from 00/10-22-047-03W4/0 was not sent for micropaleontological analysis because it has been confirmed from prior work to be the Second White Specks Formation (Bloch et al., 1999; Claudia Schröder-Adams, personal communication, 2004).

Core samples from wells 00/05-10-051-04W5/0, 00/06-11-061-22W4/0, 00/06-12-098-13W4/0 (7AS01) and 02/16-27-058-20W5/0 returned inconclusive results using micropaleontology. The first core contained rare *Inoceramus* and white specks were present. However, no planktic foraminifera species were distinguished and the samples could possibly be from the Second White Specks Formation or instead could be from the First White Specks Formation. At any rate, this could not be confirmed using micropaleontology alone. Core from well 00/06-11-061-22W4/0 was completely barren of foraminifera. Thus the sampled intercept may represent the base of the Carlile Formation (which overlies the Second White Specks Formation) because this unit is typically barren of foraminifera in southern and eastern Alberta (Claudia Schröder-Adams in Appendix 6.2). Core samples from well 00/06-12-098-13W4/0 returned planktic species of foraminifera. This would be expected during a sea level highstand and thus the core here may represent either the First of Second White Specks Formation. One of the samples included a bioclastic layer which is typical of the base of the Second White Specks Formation; however, this could not be confirmed using only micropaleontology and the species of foraminifera present (see appendix 6.2). The final core contains calcareous content and *Inoceramus*, but the interval could not be confirmed as the Second White Specks Formation due to the lack of microfossils.

Some of the cores yielded no information about the Second White Specks Formation. For example, samples from 00/02-03-101-12W4/0 (7BK03), 00/06-31-046-08W5/0, 00/06-35-059-21W4/0, 00/14-28-062-05W6/0, 00/15-21-056-19W5/0, 00/16-22-075-08W6/0 and 02/16-18-064-02W6/0 contain some fossils, but no foraminifera. Samples from the two cores, 00/04-02-071-18W5/0 and 00/10-09-066-23W5/0, were completely barren of fossils. As well, core from well 02/06-30-064-01W6/0 was given no stratigraphic placement, because although it did contain rare agglutinated foraminifera, they were poorly preserved. Therefore, none of these cores were placed stratigraphically by micropaleontology.

## 3.3 Palynology

### *3.3.1 Background*

It was necessary to date the core that did not have a stratigraphic placement and that were in key locations for the study. Samples were chosen from five cores to assign relative dates and to verify the extent of the depth to which the unit penetrates.

All samples were analyzed and described by Graham Dolby of Dolby and Associates (Graham Dolby, unpublished data, 2004).

### *3.3.2 Palynology Results*

Three samples from wells 00/06-31-046-08W5/0, 00/10-22-047-03W4/0 and 00/14-29-048-06W5/0 were confirmed as the Second White Specks Formation; the details for these samples are in Appendix 6.3. The first core was tested because it was not given a relative age using micropaleontology. Core from well 00/10-22-047-03W4/0 was sent for analysis to confirm the results stated in the study by Bloch et al., (1999); the results herein using palynology confirm that the sample is Turonian in age. The final core had not been chosen as one of the core to be sent for micropaleontological analysis; but it was decided at a later time that this core needed to be dated, and thus it was sent to the lab for palynological dating.

The sample from well 00/05-10-051-04W5/0 gave a palynological age that was no older than latest Albian. Therefore, this sample is most likely from the Second White Specks Formation, and this is confirmed by the information provided from the micropaleontology analysis (see above in section 3.2).

The core from well 00/02-03-101-12W4/0 (7BK03) was deemed very important to date because this well was the focus of the anomalous geochemistry results from Dufresne et al's (2001) work and the core represents the overall highest concentration of base and precious metals in this study. Two samples were sent for palynology analysis: one from the base of the core, and the second from the top of the core. The basal sample from 97.8 m returned a Turonian age of the Second White Specks Formation and Dolby (personal communication, 2004, Appendix 6.3) noted that the presence of certain palynomorphs indicates a restricted environment. However, the sample from 84.52 m depth indicates an inconclusive age, although the age of Santonian or younger was suggested, but not confirmed. Due to time and budget restrictions, more samples could not be sent in to confirm this date. However, Dufresne et al. (2001) also noted that there is a 4 to 8 Ma time gap between the top of the Second White Specks Formation and the overlying Lea Park Formation in the Birch Mountains region of Alberta. The problem is compounded because no geophysical logs are available for this core. Therefore, for simplicity, it is assumed for this study that the Second White Specks Formation includes the calcareous shales within the core, and the time gap exists at the top of the formation. The results from the micropaleontology and palynology analyses agreed with the core and log interpretations for the Second White Specks Formation intervals (which follow), with the exception of sample 6131.

## 3.4 Logged Core

### *3.4.1 General Description of the Sedimentology of the Second White Specks Formation*

Overall, the Second White Specks Formation is primarily composed of shales that are dominated by clays, with minor silt and micas. Generally, towards the northeast, the shale becomes siltier. The shale ranges from medium to dark grey in colour and is fissile to blocky in nature. However, very fine-to medium-sized sand laminations and beds are present in some of the cores. Planar parallel laminations dominate the sedimentary structures, but in places some micro-ripples and soft-sediment deformation features (flame structures, convoluted bedding, slumping, microfaults) exist if sand laminations or beds are present in the core.

Generally, the Second White Specks Formation reacts with hydrochloric acid because it is calcareous. Having said this, the strength of this reaction can vary throughout the length of the formation. This is because the white specks (fecal pellets comprised of calcareous coccoliths) are often present within the Formation, but they are not consistently so. The specks are usually white to yellow in colour, are sand sized and may be concentrated along laminations. Calcite nodules, ranging from 0.5 cm up to a few cms in width, often occur randomly or in clusters. Pyrite also exists as nodules, disseminations and/or grains preferentially concentrated along laminations in many of the cores. While pyrite is abundant in some cores, it is a minor component of others. In general, the concentration of pyrite appears to be higher near the base of the Second White Specks unit, and within the underlying Belle Fourche Formation.

Bentonites are often present as thin units in the Second White Speckled Shale. They range in colour from green, with disseminated pyrite, to white, to a steel blue colour. Bentonitic zones range from competent to very recessive and soft. The abundance of bentonite horizons increases towards the northeast, where core from the Birch Mountains contains the most numerous bentonites and the thickest horizons.

Abundant organic matter is common throughout the Second White Specks unit. For example, macrofossil shells are present, vary in size and type, and they often line up with the fissility. *Inoceramus*, for example is a pelecypod that is often observed. Fish debris, which may be represented by teeth, scales and bones, are often concentrated on surfaces as brown resinous matter. Bone beds occur at the base of a few cores. The bone beds comprise a large amount of organic materials, and also exist in fractures and infilling with carbonates.

### *3.4.2 Limitations of the Core*

The poor condition of some of the core material proved to be a limitation of the study. For example, of the 23 cores logged and included in this study, 3 are very fractured. Further, some of the cores had never been slabbed, therefore, making it very hard to identify sedimentary structures and grain size changes. Three of the core were only a few cms in diameter, making details very difficult to observe. In total, approximately 25 % of the cores were not in ideal condition.

Secondly, the new nomenclature of Bloch et al. (1999) for the Second White Specks Formation, which is used in this work, is not used within the Accumap program. This made it difficult to search for core and logs in this study. It is, therefore, virtually impossible to create a search for the Second White Specks Formation because the underlying shales between the Fish Scales Formation and the Second White Specks Formation have not been divided into the Belle Fourche Formation (see Section 2.2.1 and Figure 2.1). As a result, when a search for core from the Second White Specks Formation was entered, the results returned all shales between the top pick for the Second White Specks Formation and the base of the Fish Scales Formation. This meant that, in some cases, core from the Belle Fourche Formation was improperly identified in the search as lying within the Second White Specks Formation. As a result, some of the cores which were logged, were later identified as the Belle Fourche Formation by sedimentology and micropaleontology dates (see Appendix 6.2). As well, above and below the Second White Specks Formation there also are shales. Finally, the log signature of the Second White Specks Formation varies widely across the basin, thus it was essential in some cases to see the core in order to try and identify which formation the shale actually belongs to.

### *3.4.3 Contacts with the Overlying and Underlying Formations*

Only two cores logged in this study have contacts with both the overlying and underlying units. One core was from the Birch Mountains while the other was from well 10-22-047-03W4 (see Figure 3.1). In some cases it is difficult to identify contacts with the overlying and underlying units. It is also difficult to identify with certainty which unit is present when one or both contacts are missing. Micropaleontology and Palynology samples were therefore sent to help give dates to the formations (see "micropaleontology" and "palynology" sections above for summaries, and the Appendix for details).

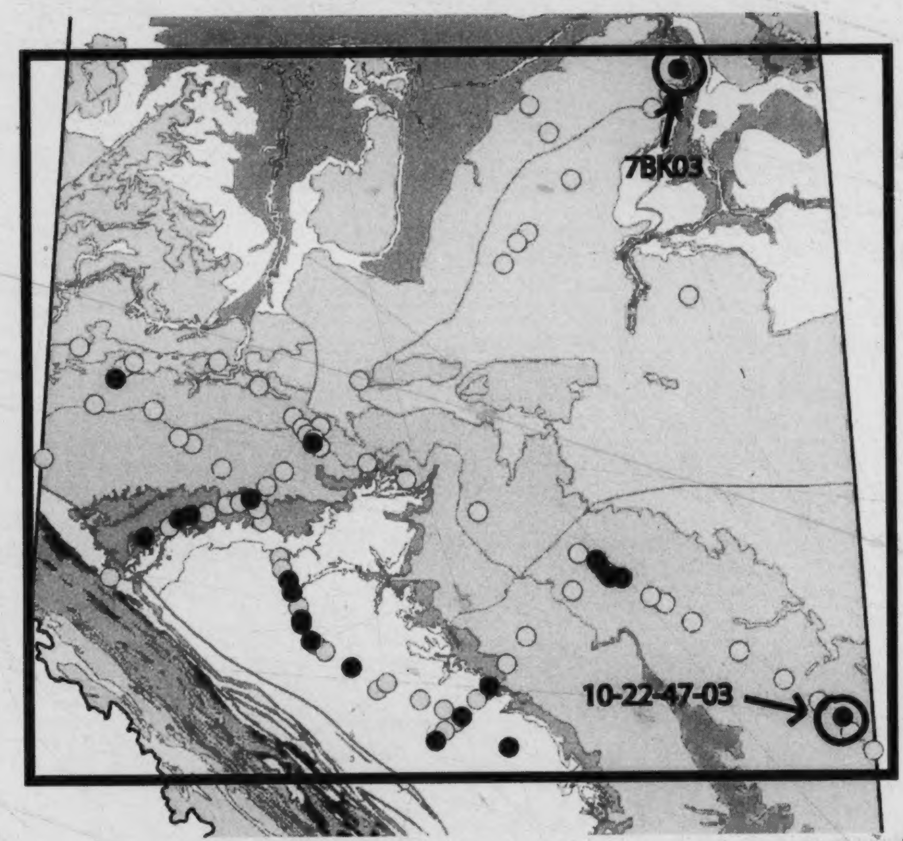

**Figure 3.1:** Study area showing the location of the two cores that contain both the upper and lower contacts of the Second White Specks Formation.

Following is a brief summary of the Carlile, Second White Specks and Belle Fourche Formations for the most complete and dated core from well 10-22-047-03W4.

| | |
|---|---|
| Carlile Formation | * Little to no reaction with HCl, minor bentonites, dark grey in colour, little organic debris |
| ____________________ | * Base Carlile/top Second White Specks contact is fairly sharp (organic debris decreasing up section) |
| Second White Specks Formation | * White specks present; moderate to strong reaction with HCl; minor sandy laminations; medium grey |

| | |
|---|---|
| | colour; *Inoceramus*, fish debris, disseminated pyrite near the base |
| | * Base Second White Specks/top Belle Fourche contact is gradual, with the abundance of pyrite increasing down hole |
| Belle Fourche Formation | * Decrease in reaction with HCl down hole, occasional pyritic mineralized zone (1-5%); fish and shelly debris increasing up hole; may have siderite nodules) |

### *3.4.4 Descriptions and Interpretations for the Logged Core*

The following section includes summaries of the observations and short interpretations for each core logged in this study except for the core that were identified as not containing the Second White Specks Formation. These extra descriptions of core are included with the logged core forms in Appendix 6.1.

**00/02-03-101-12W4/0 (7BK03): Birch Mountains**
*Core:* 72.17m – 102.05m
*Second White Specks interval:* 74.875m – 100.94m
*Observations:*

The interval is dominated by a dark grey calcareous shale which contains clay with minor silt, disseminated pyrite, shell and fish fragments. White specks are not visible in the Birch Mountains core (i.e.: 7BK03 and 7AS01). Bentonites are abundant throughout the interval and are the most abundant of any core logged in this study. The bentonites are steel blue/grey in colour and range in thickness from a couple mms to 26cm. A total of 28 bentonites are identified within the 26m Second White Specks

Formation interval. At the base of the interval there is fracturing and carbonate fills the veins and fractures. There are abundant shells and fish debris in what appears to be two sandy bone beds in-filled with carbonate. No bioturbation is observed. The core is fairly homogeneous. The shale is siltier than the shales of the Second White Specks Formation south of the Birch Mountains.

*Interpretation:*

The core comes from the Fort MacKay area of northeastern Alberta. The core represents the whole interval of the Second White Specks Formation and also contains the upper and lower contacts. The absence of coarser grains, and the dominance of finer grains, suggests a low energy environment. This agrees with the observation that abundant bentonites are preserved. The bentonites found in the Birch Mountains core do not all correlate with bentonites found in central and southern Alberta. Due to the presence of abundant bentonites compared with the southern wells, local volcanism is suggested (Dufresne et al., 2001) and is discussed in the following sections. There are very few sand sized particles and the coarsest grains are dominated by silt sized particles and organic debris which are concentrated by contourites. The two bone beds at the base of the interval may have been kill zones where abundant fish and shelly debris accumulated. The core is fairly homogeneous indicating that the environment of deposition remained stable and low energy. As the shale is fairly silty compared to the core in the southern Alberta locations, it is inferred that the site of deposition was closer to the sedimentary entry point (the paleoshoreline).

**00/05-10-051-04W5/0: Wabamun No 1**

*Core:* 1252.36m – 1305. 675m

*Second White Specks interval from cross section:* 1202m – 1289m

*Observations:*

The core has a very small diameter, making it difficult to log. At the base of the core is a dark grey shale with minor silt and organic debris. A 9 cm thick bentonite is observed as well as minor very fine silty laminations. At a depth of 1303m, sand is no longer observable. The shale has minor shells and a weak reaction with hydrochloric acid. With decreasing depth in the core the only change observed is a few minor very fine sand laminations between the depths of 1292m to 1285.5m, along with a few 0.5-1cm ripples near the top. A few siderite grains and cement are observed at 1287.8m. Stratigraphically above the sand laminations, within the shale, is a dark grey shale with minor silt, shelly and fish debris and planar parallel laminations. The reaction with hydrochloric acid increases up the logged section. The core is a homogenous dark grey shale at the top. It contains minor disseminated pyrite, and a few thin mm thick bentonites are observable.

*Interpretation:*

The core is found near the base of the Second White Specks interval and has a lower contact with the underlying Belle Fourche Formation. The core is dominated by a dark grey shale with minor silt and represents sedimentation in a low energy environment. The silt and organics were concentrated into laminations and small ripples by contourites. This is supported by the observation of a few small asymmetrical ripples which indicate a unidirectional current and the overall fine grained nature of the sediment, which is discussed further in the following section. There was an increase in current activity, due to the presence of minor sand laminations up section. Through time, as the sea level continued to rise, the paleoshoreline moved further away from the site of deposition. The energy was low enough to preserve bentonites.

**00/06-11-061-22W4/0: Northstar Abee 6-11-61-22**

*Core:* 499.85m – 513.52m

*Second White Specks interval from cross section:* 506m – 553m

*Observations:*

The base of the core comprises a dark grey shale with shelly material, minor bioturbation, minor sandy laminations and soft sediment deformation. A sandy package is present up the logged section of the shale with minor bioturbation, shale laminations, ripples and soft sediment deformation. There is a transition into overlying dark grey shales with white specks, ripples, fine sandy laminations and minor soft sediment deformation. Minor burrows are observed along with a bentonite horizon. The dark grey shale and sand laminations continue up the core, and are fairly consistent, although the bioturbation is no longer observed at the top of the core.

*Interpretation:*

The core represents the top of the Belle Fourche Formation and the base of the Second White Specks Formation. At the base of the core there is abundant sand and bioturbation which is expected for the Belle Fourche Formation. The sediments fine upward toward the bentonite layer, indicating that the sea level was rising and the presence of a bentonite is observed at the base of the Second White Specks Formation. The environment was hospitable to organisms (there is a small amount of bioturbation), but was also able to preserve some organic material. The core above the bentonite (which is represented by the Second White Specks Formation) is dominated by shales which indicate a quieter low energy environment but where contourites were still able to transport sands. Currents were able to concentrate the coarser grains into laminations and lenses. The environment became less hospitable to organisms.

**00/06-12-098-13W4/0 (7AS01): Birch Mountains**

*Core:* 11.27m – 19.48m

*Second White Specks interval:* 11.27m - 18.48m

*Observations:*

This core is from the Birch Mountains, slightly south of 7BK03. At the base of the available core is a light to medium grey shale, with an overlying bed of siltstone. Above the siltstone is a dark grey silty shale that coarsens upwards into a siltstone. Up the logged core are two crystalline sandstone beds that appear out of place within the shale and are discussed in the interpretation below. Above this is lost core (see Appendix 6.1) then a light to medium grey silty shale with abundant bentonite horizons (10 bentonites within 2.5m thickness), some shelly and fish debris, and a strong reaction with hydrochloric acid. Between 14.5m to 14m depth, a few small scale ripples were observed.

*Interpretation:*

The core begins at the surface and covers the contact between the Second White Specks Formation and the underlying unit, the Belle Fourche Formation. The actual contact between the two formations appears to have been lost in section of lost core which is recorded on the logging form (see appendix 6.1) The lithologies present in the core are fairly uniform, suggesting a consistent environment of deposition. The environment was lower energy and had the capacity to preserve organic debris and bentonitic horizons. The currents most likely concentrated the sand, silt and organic debris, as well as producing the observed ripples. The shale in this core is coarser grained than the Second White Specks Formation cores south of the Birch Mountains and appears similar in lithology to the core from 7BK03. This is probably due to the fact it was closer to the paleoshoreline, allowing the coarser grains to be brought to the deeper basin where the shales were deposited.

The two units that are crystalline in nature and embedded within the interval appear to be glacial deposits. The rock does not look like anything seen or described within the Second White Specks Formation, is white, coarse crystalline in nature, has abrupt sharp contacts and does not resemble sands previously observed in the Second White Specks Formation, which are not crystalline. It is also noted that the core lies within 20m of the surface in the Birch Mountains, and it is probable that glacial sediments could be deposited within the unit. These would be eroded sediments from the glaciers that were deposited within the shales.

**00/06-26-059-20W4/0: Northstar Radway 6-26-59-20**

*Core:* 458.09m – 471.05m

*Second White Specks interval from cross section:* 447m – 486m

*Observations:*

The core is fairly uniform. It consists of a dark grey shale with a moderate reaction with hydrochloric acid and fish debris, minor silt, sand and abundant shelly debris (see Plate 3.2A) at the base of the core. There is no visible grain size change. There are a few bentonites which occur throughout the interval. White specks are observed, and pyrite in disseminated and nodular form occurs towards the top of the succession. One third of the way up the core, calcite nodules are observed.

*Interpretation:*

The core is from the center of the interval of the Second White Specks Formation. There are no contacts with the overlying or underlying units. This was a quiet, deeper marine environment where currents concentrated silt, sand, shells and fish debris in between the planar parallel laminations of shales. The waters had low enough energy to preserve bentonite horizons. The environment of deposition remained fairly constant, as the section of core does not show many physical changes.

**00/06-31-046-08W5/0: Amoco Pembina**

*Core:* 1803m – 1822.49m

*Second White Specks interval from cross section:* 1782m – 1904m

*Observations:*

The core is homogeneous. It is composed of a dark grey shale with minor silt and sand grains, with a strong reaction to hydrochloric acid, shell debris and parallel laminations. At 1820.5m depth, calcareous nodules are observed. White specks and fish debris occur above this depth. At 1816.2m depth, a light grey upper very fine sand lamination with disseminated pyrite is observed. The shale remains uniform to the top of the core.

*Interpretation:*

This section of core lies within the Second White Specks Formation interval, and does not represent any contacts with overlying or underlying formations. The environment remained fairly constant because there was not much change seen within the core. This was a low energy, deeper environment with currents moving and concentrating the sands, silts and organic debris. The sea floor was hospitable to the preservation of organic debris and pyrite. This core did not experience much sand deposition from contourites.

**00/06-35-059-21W4/0: Grt Plns Thorhild 6-35-59-21**

*Core:* 457.18m – 469.37m

*Second White Specks interval from cross section:* 463m – 504m

*Observations:*

The base of the core comprises a dark grey shale that reacts vigorously with hydrochloric acid. Steel grey bentonites are visible, and very fine sandy laminations occur along with ripples. White specks are abundant. Stratigraphically higher, the sandy laminations coarsen into fine grained sediments. Ripples and soft sediment deformation become more abundant. The overlying shale is composed of dark grey shales that have weak, to no reaction, with hydrochloric acid. The abundance of sandy laminations decreases upwards, however, siderite is visible near the top of the core.

*Interpretation:*

The core straddles the boundary between the Second White Specks Formation and the overlying unit, most likely the Carlile Formation. The base of the core (represented by the Second White Specks Formation) consists of a low energy depositional environment because of the fine grained sediments and the preservation of bentonites. The unit is typical of the Second White Specks Formation, and sands with ripples indicate that there was a unidirectional current, most likely contourites, concentrating coarser grained sediment. Stratigraphically above the Second White Specks Formation is the Carlile Formation which has no reaction with hydrochloric acid and contains siderite concretions. The energy of deposition is still low, with contourites continuing to concentrate coarser grained sediment.

**00/09-09-056-19W5/0: HCS Et Al Beavercreek 9-9-56-19**

*Core:* 2237.12m – 2273.09m

*Second White Specks interval from cross section:* 2198m – 2282m

*Observations:*

The core is fairly uniform, consisting of a clay-rich dark grey shale containing minor silt. Shelly debris persists throughout the interval (see Plate 3.2B, 3.2C), as well as disseminated pyrite (see Plate 3.4A), and pyritized shells. The unit contains abundant organic debris. Near the base of the core, calcite nodules are present. There is generally a weak reaction with hydrochloric acid. Bentonite horizons are preserved. Above the section of lost core indicated in the logging form (in the Appendix 6.1) the Second White Specks Formation reacts strongly with hydrochloric acid. Minor thin sandy calcareous laminations are visible, often with disseminated pyrite. At approximately 2245m depth, abundant pyrite nodules are present. Above this, minor very fine sandy laminations are visible. Near the top of the core, the reaction with hydrochloric acid decreases. The core is dominated by dark grey shale with abundant shelly debris, minor silt and disseminated pyrite.

*Interpretation:*

This core lies within the Second White Specks Formation, towards the top of the interval, with no contacts with the overlying or underlying units. The core is fairly uniform, indicating that there was not a lot of change in the environment of deposition. The environment appears to be anoxic due to the preservation of abundant pyrite and organic debris. Bentonites are preserved near the base of the interval indicating that there was volcanism. Abundant fine grained sediments are also preserved indicating a quiet environment. There are interdispersed sandy laminations and pockets of silt which were most likely concentrated by currents.

**00/10-22-047-03W4/0: Anderson Et Al Paradise 10-22-47-3**

*Core:* 409.02m – 463.27m

*Second White Specks interval from cross section:* 426m – 440m

Using micropaleontology analyses (see above section), this unit was confirmed to be the Second White Specks Formation between 426.7m and 440.415m depth (Schröder-Adams, personal communication, 2004). This is the only core south of the Birch Mountains in this study that has both top and basal contacts.

*Observations:*

Carlile Formation:

This is a medium to dark grey shale with little to no reaction with hydrochloric acid. There is also some fish debris in places. Bentonites are present throughout the interval and the thickest (up to 15 cm) bentonites are at the top of the unit. There are abundant, thin, calcareous, very fine sandy laminations. Minor sandy ripples are present. Some shells and shelly debris are present. The organic debris increases in abundance towards the underlying contact with the Second White Specks Formation.

Second White Specks Formation:

The upper contact with the overlying Carlile Formation is fairly sharp, changing from the overlying dark grey shales of the Carlile Formation to the underlying medium grey shales of the Second White Specks Formation. There is also a greater abundance of organic debris in the Second White Speckled Shale. White specks are visible and they have a strong reaction with hydrochloric acid. At the base of the Carlile Formation there is a slight increase in the abundance of fine sandy laminations just before the contact with the Second White Specks Formation.

In general, the Second White Specks interval is fairly uniform in that it is a fissile, medium grey shale dominated by clays with abundant white specks (see Plate 3.3B). It reacts vigorously with hydrochloric acid. The Formation contains white/grey coloured fine sand laminations up to 3 mm in thickness. There is abundant fish debris and shells, including *Inoceramus*. There are a few very thin steel grey coloured bentonites. Minor disseminated pyrite is visible near the base of the unit.

The basal contact between the underlying Belle Fourche and the overlying Second White Specks is gradual. The shale becomes blocky. The reaction with hydrochloric acid decreases. Multiple millimeter thick bentonites are present at the base. At the top of the Belle Fourche Formation, there is an increase in the abundance of sandy laminations, as well as ripples and soft sediment deformation.

Belle Fourche Formation:

This is a dark grey shale. At the base of the unit, there are very few sandy laminations. In places, there is a strong reaction with hydrochloric acid. In other locations, there is weak to no reaction with acid. Some thin bentonites occur throughout the Formation, but they are concentrated at 459.5 m and 447.25 m depth. At approximately 458 m depth, there is an increase up section in the abundance of pyrite, both in disseminated and nodular form. The shale is finely laminated, with minor sandy laminations. At 454.13 m to 455.67 m depth, a heavy mineralized zone of pyrite is observed. Upward in the Belle Fourche Formation, fish and shelly debris increases. The abundance of sand laminations also increases. Minor bioturbation is present. The upper contact of the Belle Fourche Formation with the overlying Second White Specks Formation shows an increased occurrence of sandy laminations, an increase in the abundance of fish and shelly debris, and as well ripples and soft sediment deformation.

*Interpretation:*

The base of the Belle Fourche Formation in core is dominated by shales with few sandy laminations and the occurrence of bentonites. This indicates a deep, quiet environment for the bentonites to be preserved. The concentration of silt, sand, fish and shell debris appears to have been transported by currents. There is no evidence of any bioturbation. Primary bedding structures are still apparent. At 458 m depth, there is an increase in pyrite, which is indicative of an anoxic environment. The preservation of pyrite continues up section and includes a 20 cm thick unit that is pervasively pyritized.

An increase in the abundance of sandy laminations occurs upward, as well as an increase in the amount of organic debris within the Belle Fourche. Soft sediment deformation and ripples are locally present. The asymmetrical ripples point to a unidirectional current and also indicates an enhanced current activity that allowed an increased amount of sand to be transported to the sight of deposition. The contourites also concentrated an increased amount of organic debris. Finally, because bentonites are preserved, this indicates the energy was low at the deposition site.

The preservation of more organic remains marks the deposition of the Second White Specks. The concentration of the white specks into laminations by currents is apparent. Bentonites are preserved, and much fewer sandy laminations are present. A bentonite horizon, along with an increase in the abundance of organic debris, is present at the base of the formation in the core. The unit is fairly uniform with abundant organic debris being preserved. Minor amounts of pyrite are present, and indicate a reducing environment.

Near the contact with the overlying Carlile Formation, the abundance of sand laminations increases within the Second White Specks Formation, indicating an increase in the current activity and this transported the coarser grains to deeper waters. Ripples and soft sediment deformation occur near the contact; this may be due to storm activity and current reworking. The contact between the two units is sharp (moving into a darker shale) and this may indicate a decrease in the abundance of organic matter, but the environment of deposition in both the Second White Specks and Carlile Formation shales remained low energy. Primary sedimentary structures are still present and the low energy environment allowed the preservation of bentonites within the Carlile Formation, as well as laminations and ripples. It appears that there was intermittent activity depositing the coarser sands, while still allowing the deposition of much finer grains.

**00/10-28-059-20W5/0: Hol Taurvs Fir 10-28-59-20**

*Core:* 1876.56m – 1888.5m

*Second White Specks interval from cross section:* 1787m – 1906m

*Observations:*

The core is not slabbed. It is rubbly in some areas, therefore, it was difficult to carry out detailed descriptions of the core. The base of the core consists of a dark grey shale with little to no reaction with hydrochloric acid. The shale is dominated by clays. Minor silt and shelly debris (see Plate 3.2D) increases in abundance up section. A few siderite grains are visible, as well as a thin bentonitic horizon.

Moving up section, the reaction with hydrochloric acid increases. At approximately 1883.5m depth, disseminated pyrite and pyritized shells become apparent. Very fine calcareous sandy laminations become more abundant with decreasing depth. Near the top of the core, small ripples and loading is observed, as well as pyrite within calcareous laminations, and abundant shelly debris.

*Interpretation:*

This core is found near the base of the Second White Specks Formation interval. The base of the core represents a low energy deeper environment. The environment preserved a fine grained bentonite. The silt and shelly debris was most likely concentrated by currents. The environment was anoxic and preserved pyrite and pyritized shells. Moving up section, calcareous sandy laminations increased in abundance, due to an increase in the current activity, allowing coarser grains to be carried out to the deeper water environment. This is also supported by the fact that ripples are observed, indicating a unidirectional current. The environment continues to be fairly inhospitable to organisms as no bioturbation is observed.

**00/10-36-060-22W4/0: Amoco Thorhild 10-36-60-22**

*Core:* 489.79m – 498.59m

*Second White Specks interval from cross section:* 491m – 535m

*Observations:*

At the base of the core is a dark grey shale that reacts vigorously with hydrochloric acid. It contains laminations of fine to medium grained sand that increase in abundance up section. The shale contains minor fish and shelly debris and some soft sediment deformation (see Plate 3.3C). At approximately 496.50m depth, there is a dramatic increase up the logged core in the sand to shale ratio. The unit becomes much sandier, with laminations of shale and minor bioturbation present. Continuing up the core at approximately 493.75m, the sand to shale ratio decreases. This section is composed of a dark grey shale with thin sandy laminations which fine upwards. There is abundant fish and shelly debris, as well as some soft sediment deformation.

*Interpretation:*

This core partially lies at the top of the Second White Specks Formation and the contact between the overlying Carlile Formation. There is a gradual contact between the Second White Specks and the Carlile Formation. White specks are observed at the base of the core and there is a reaction with hydrochloric acid, therefore, it appears that this is the top of the Second White Specks Formation. The mixture of shale with sand laminations was deposited in a deeper marine setting. During the time of deposition, contour currents transported and deposited the coarser grains while there were periods where the contourites carried much more sand in this location. This agrees with the unidirectional ripples and soft sediment deformation observed. Because of the presence of bioturbation where the sand to shale ratio increases, there is indication that the time and location of sediment deposition was slightly more hospitable to organisms. It must also be noted that the location of core is W4, and was deposited in a location that was closer to the paleoshoreline. Near the top of the cored section, the environment became less hospitable to organisms as the sea level continued to rise during the highstand (see section on sequence stratigraphy). The environment of deposition remained fairly low energy, as the dominant sediment continues to be shale, but where currents were still able to concentrate and transport sands, silts and organic matter.

**00/14-29-048-06W5/0: Imp Cdn-Sup Pembina 14-29 Br-48-6**

*Core:* 1539.16m – 1577.32m

*Second White Specks interval from cross section:* 1532m – 1595m

*Observations:*

The core has a very small diameter, therefore, details can be difficult to observe. There appears to be some lost/extra core in areas, therefore, the depths may not be trusted to be true in all cases. At the base of the core is a dark grey shale with minor silt, fish debris and weak to no reaction with hydrochloric acid. There is an interval of lost core. Above this is a dark grey shale with minor silt with an increasing reaction with hydrochloric acid up the core. White specks are observed as well as shell and fish debris. A bentonite is observed in addition to a very fine sand lamination.

Up section, the very fine sand laminations become slightly more abundant. The silt percentage of the shale also increases slightly. Pyrite is observed (see Plate 3.4B). In between 1559.5m and 1557m depth, the sand laminations increase in abundance. Ripples and soft sediment deformation are apparent. A bentonite is observed in this interval. Moving up the logged core, the sand laminations decrease in abundance. Sand occurs dominantly in lenses. There is a strong reaction with hydrochloric acid. A bentonite is observed as well as disseminated pyrite, shell and fish debris. White specks are perceived and the remaining top of the core is fairly homogeneous.

*Interpretation:*

The core is representative of the top and the center of the Second White Specks interval for this hole. There are no contacts with the overlying or underlying units. This is a lower energy environment, dominated by fine grained sediments with minor silt and sand, which were most likely concentrated by currents. Shells, fish debris and other organic matter, as well as pyrite, were preserved due to anoxic sediment.

The environment of deposition remained fairly constant, aside from a slight increase in the percentage of silt and sand due to an increase in activity of the contourites. This agrees with the unidirectional ripples observed and the minor soft sediment deformation. The sand and silt percentages then decreased near the top of the core, due to a decrease in current activity.

**00/16-12-046-03W5/0: Imperial-Battle Lake No 1**

*Core:* 1533.07m – 1574.99m

*Second White Specks interval from cross section:* 1474m – 1552m

*Observations:*

This core has a very small diameter, and logging in detail was difficult. The base of the core comprises a dark grey shale with weak to no reaction with hydrochloric acid. It includes lenses of very fine sand and silt. Shell debris is present. Above the section of lost core, fish debris is also observed. There is a "burnt looking" unit at 1571m depth. It is red/black in colour and heavily mineralized and contains pyrite. At 1566m depth, multiple bentonite horizons are observable. Pyrite and a pyrite nodules are discernable, as well as grains of siderite. A few small scale ripples are observed at 1558m, as well as large shells, some of which are pyritized.

The core above the lost core includes a dark grey shale with less silt and sand present than the underlying shale. There are minor white specks, fish debris and shell debris present. The reaction with hydrochloric acid increases up the core. A bentonite is observed at 1543.3m depth. At 1542m depth, a calcareous fine sandy lamination is observed with disseminated pyrite. The percentage of sand continues to decline up section. White specks and disseminated pyrite can easily be observed at the top of the core.

*Interpretation:*

This core is found at the base of the Second White Specks Formation, and the top of the underlying Belle Fourche Formation. The location of core where there should be a contact between the Belle Fourche and the Second White Specks is part of the lost core. The underlying Belle Fourche Formation was deposited in a deeper water, low energy environment. There was a gradual change from the Belle Fourche to the Second White Specks unit which had a strong reaction with hydrochloric acid and contains white specks, although the actual contact is missing due to lost core. The Second White Specks shale contains silty and very fine sandy lenses, most likely deposited and concentrated by currents. The environment was fairly anoxic because pyrite and organic matter was preserved. The core, however, remains fairly constant as did the depositional environment. The only noticeable difference in this core between the Second White Specks and the Belle Fourche was that the Second White Specks had a much more vigorous reaction with hydrochloric acid.

**02/06-30-064-01W6/0: Rax Et Al 102 KA Karr 6-30-64-1**

*Core:* 1555m – 1563.6m

*Second White Specks interval from cross section:* 1515m - ?

*Observations:*

The core begins with a dark grey shale and very fine sand laminations (see figure 3.1A) with interfingering ripples and cross laminations. These are starved ripples where the tops of the laminations are truncated. Calcite nodules are observed. There is a weak reaction with hydrochloric acid. White specks are abundant, as well as loading and convoluted bedding. In the center of the core, there is disseminated pyrite. Upwards, the occurrence of sand laminations decreases. The core is fairly uniform. White specks can be seen throughout the whole unit (aside from the very top of the core). The specks are slightly yellow and react mildly to vigorously with hydrochloric acid. The top of the unit is more calcareous than the base of the unit.

*Interpretation:*

It is not known how near to the base of the Second White Specks interval this core lies. There was not much changing throughout the core. The grain sizes remained fairly constant indicating that the environment of deposition remained fairly constant during the deposition of the logged section. This was a low energy environment. The organic debris, white specks, sand and silt appeared to have been concentrated by currents. This agrees with the unidirectional ripples observed and the soft sediment deformation. The bottom waters were most likely anoxic due to the lack of bioturbation and the preservation of organics and pyrite.

**02/07-33-052-15W5/0: Husky Et Al Skinner 7-33-52-15**

*Core:* 1950m – 1969.18m

*Second White Specks interval from cross section:* 1880m – 1955m

*Observations:*

The interval is fairly uniform. The basal section of the core is a dark grey shale dominated by clays, with minor silt and little to-no-reaction with hydrochloric acid. There is some fish (see Plate 3.3A) and shelly debris. Some shells have been pyritized. Some very fine sandy lenses can be discerned. Up the core, *Inoceramus* shells can be identified, as well a few very fine sand laminations. The upper shale is composed of the same dark grey shale, with a moderate reaction with hydrochloric acid. Shells, fish debris and organics are abundant as well as disseminated pyrite, and pyrite replacing shells.

*Interpretation:*

The core occurs near the base of the Second White Specks Formation interval. It crosses into the underlying Belle Fourche Formation. There was not much change seen in this core. It was fairly homogeneous with the contact between the Second White Specks and the Belle Fourche being very gradual. The shales were deposited within a low energy, deep marine setting. The location was reducing, allowing the preservation of pyrite, and pyritization of shells. Abundant organic matter was also preserved. Currents were most likely the mechanism by which silt, sand and organic matter was concentrated. The physical differences observed in the core, include the presence of *Inoceramus* within the Second White Specks Formation and in increase in reaction with hydrochloric acid.

**02/16-18-064-02W6/0: Rax Et Al 102 KA Karr 16-18-64-2**

*Core:* 1696m – 1706.1m

*Second White Specks interval from cross section:* 1659m – 1717m

*Observations:*

There is not much change in lithology throughout the core. It is dominated by a dark grey shale, with minor shells, very fine sandy laminations, abundant ripples and soft sediment deformation. At 1699.8m depth there is a calcite concretion. Up section, minor pyrite is observable. There is generally a weak reaction with hydrochloric acid. The reaction with the shale results in a sulphurous smell. The occurrence of sand laminations increases slightly up the core, along with an increase in the appearance of cross laminations, ripples and soft sediment loading. The core is zebra-like in colour, where the shale is black and with white laminations comprised of white specks (coccolith debris).

*Interpretation:*

The interval of core lies within the center/base of the Second White Specks Formation. The core seems typical of the Second White Specks Formation. It is a very fine grained shale indicating a low energy of deposition. Contourites concentrated the sand sized grains, silt and organic matter into unidirectional ripples, and deformed them through soft sediment deformation. The interbedded sandy laminations are almost white in comparison with the surrounding dark shale and are most likely concentrated with white specks making them almost white in colour. There was not much change throughout this core. This was an indication that the environment remained unchanging, as the thickness and abundance of sandy laminations did not change much throughout the unit.

**02/16-27-058-20W5/0: Amoco Pinenm 16-27 Ek-58-20**

*Core:* 1825.05m – 1836.8m

*Second White Specks interval from cross section:* 1772m – 1856m

*Observations:*

Many locations of the core are rubbly. The core has not been slabbed. As a result, features are hard to distinguish. The core is fairly homogeneous. It is dominated by a mica rich dark grey shale with lenses of silt, some shells (*Inoceramus*) and very fine sandy calcareous laminations. It appears that the core is siltier towards the base, along with a minor increase in abundance of shells in the center of the unit. There is a minor increase in the occurrence of calcareous laminations towards the top. The reaction with hydrochloric acid ranges from weak to strong, with minor disseminated pyrite and pyritized shells. One bentonite is identified at 1832.72m depth. No white specks are observed.

*Interpretation:*

The core is found in the base/center of the interval of the Second White Specks Formation and there are no contacts with underlying or overlying units. The environment of deposition was fairly constant, due to the lack of heterogeneity observed in the core. The sediments were deposited in a low energy, deeper environment. The environment allowed fine grained sediments to be preserved without any visible bioturbation. Silts and sandy laminations could have been concentrated by currents. The occurrence of pyrite and pyritized shells and the lack of bioturbation indicated that the environment was anoxic and inhospitable to organisms. This also preserved the organics within the dark grey shale. An increase in current influence would explain the small increase in occurrence of sandy laminations towards the top of the core.

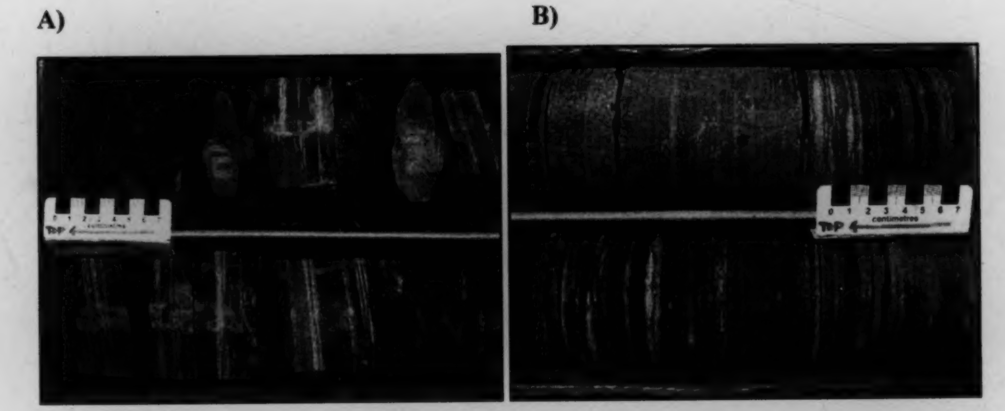

**Plate 3.1:** Pictures of various core: A) Core from well 02/06-30-064-01W6/0 with shale core with abundant lenses and laminations, 1550 m depth; B) Core from well 00/06-03-061-22W4/0 with shale core showing lensing, laminations and soft sediment deformation, 504.15 m depth.

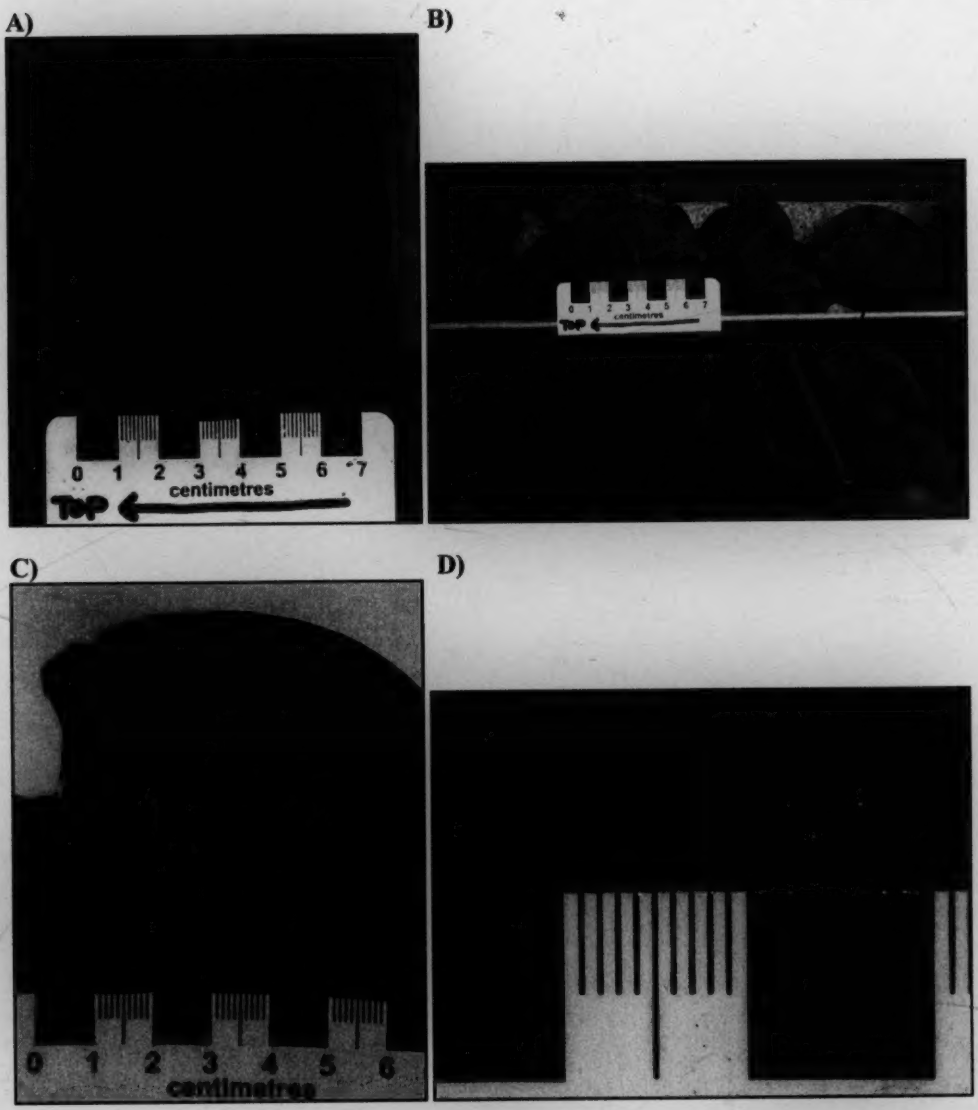
A)
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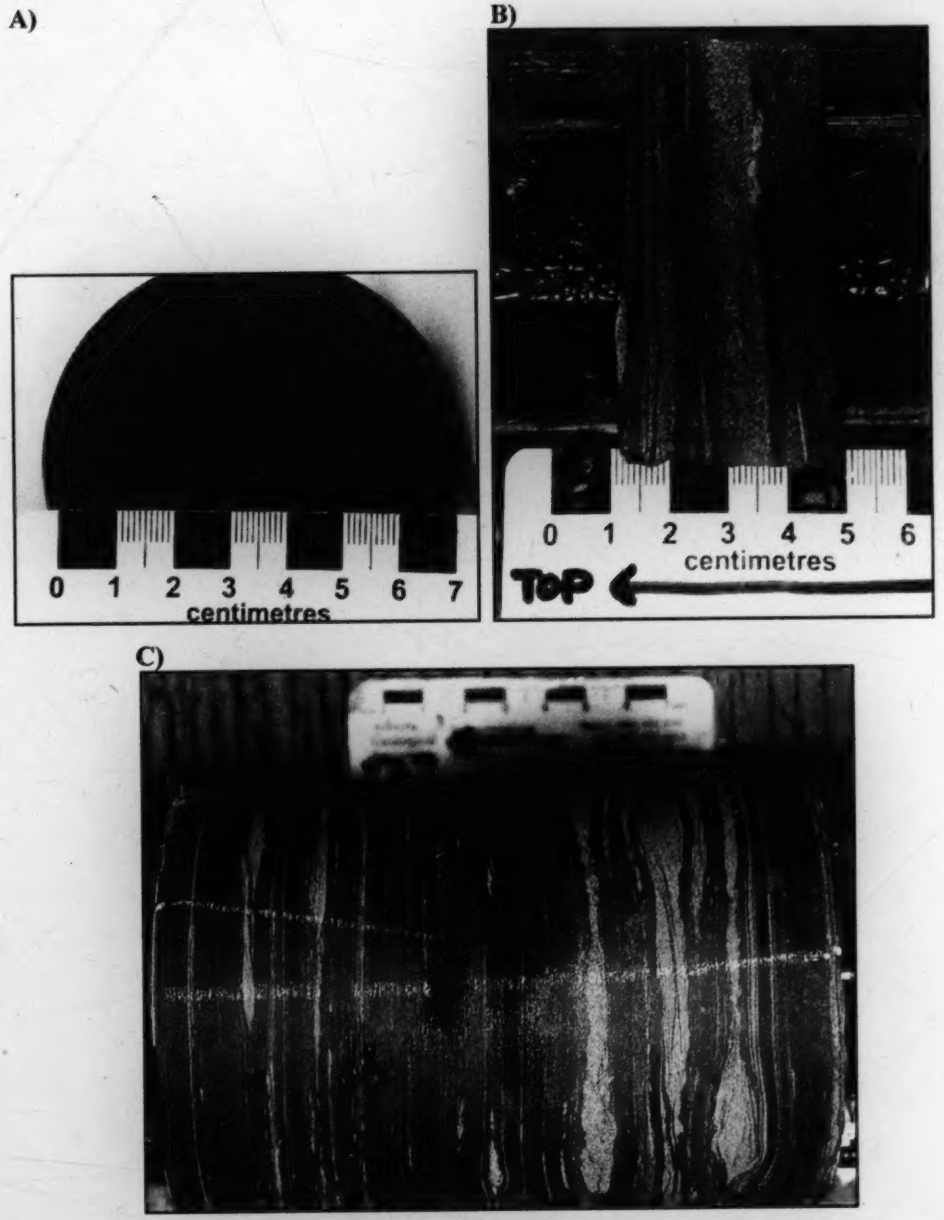
**Plate 3.2:** Pictures of various core: A) Core from well 00/06-26-059-20W4/0 with a cross section through a large shell at 458.9 m depth; B) Core from well 00/09-09-056-19W5/0 shows broken dark grey shale core, with abundant shelly imprints, at 2246.42 m depth; C) Core from well 00/09-09-056-19W5/0 shows a large shell within dark grey shale at 2247.58 m depth and D) Core from well 00/10-28-059-20W5 shows a dark grey shale with a very small organic debris… (the scale is in cms; see picture C) at 1879.14 m depth.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C)

**Plate 3.3:** Pictures of various core: A) Core from well 02/07-33-052-15W5/0 shows a broken surface of dark grey shale with fish debris at 1967.54 m depth; B) Core from well 00/10-22-047-03W4/0 shows abundant white specks, some are disseminated, some are concentrated into laminations and react vigorously with HCl, at 427.995 m depth and C) Core from well 00/10-36-060-22W4/0 shows small scale ripples and soft sediment deformation, at 498.17 to 498.3 m depth.

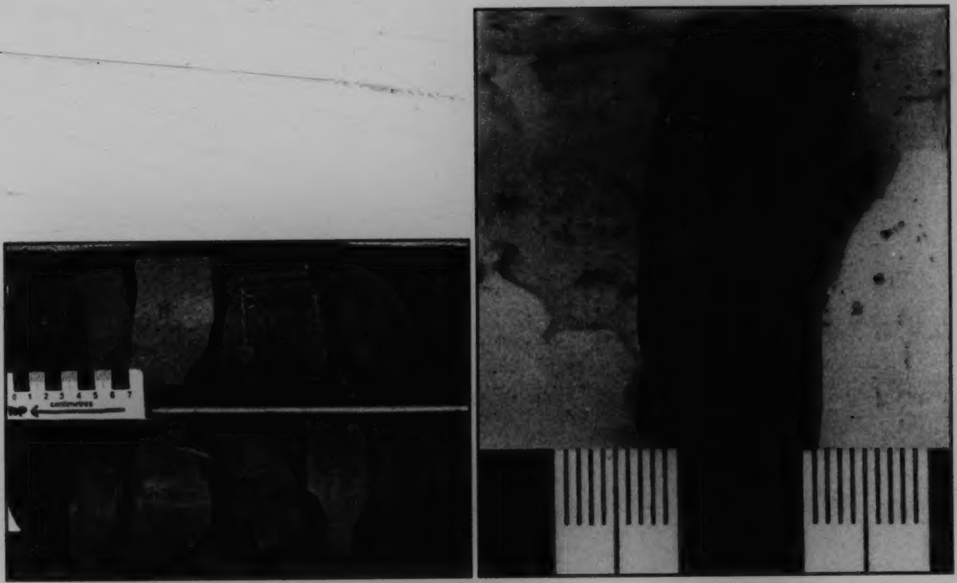


**Plate 3.4:** Pictures of various core: A) Core from well 00/09-09-056-19W5/0 shows two pyrite nodules at 2244.87 m depth and B) Core from well 00/14-29-048-06W5/0 shows a lense of pyrite at 1567.03 to 1567.035 m depth.

### 3.5 Contourites and a General Discussion of the Core

West of the 6th meridian (118 degrees west longitude), the core from this part of the study represents sedimentation within the deepest location of the basin during the Mid-Late Cretaceous. Only four cores from this area were logged in this study, and only two of them appear to contain an interval of the Second White Specks Formation, whereas and the other two appear to cover the underlying Belle Fourche Formation. None of the core contains contacts with the overlying and underlying units; therefore, the descriptions are of the center of the formations. Within the underlying Belle Fourche Formation, sand laminations within a dark grey shale and minor bioturbation was observed. From the observations, the Belle Fourche within the deep basin was deposited in a fairly low energy environment, but it could still support minor biota on the sea floor. The waters were, therefore, oxygenated enough and contour currents could transport and concentrate sands and shell debris. Siderite is also a common occurrence within the Belle Fourche Formation.

Generally, the Second White Specks in the area is represented by a uniform dark grey shale and minor sand laminations. Located in the deepest part of the foreland basin, it is expected that the environment of deposition was of the lowest energy and remained fairly stable. This agrees with what was observed in the core. As opposed to the underlying Belle Fourche Formation, there is no bioturbation present and this indicates that the environment became more anoxic and inhospitable for organisms. Bentonites are also not recorded in these cores of the Second White Specks Formation. This is due to either the source of volcanism being too far away to reach the location of deposition or else the depths where the bentonites occur were not cored. It should be noted that often a bentonite occurs near the base of the Second White Specks Formation (Bloch et al., 1999), therefore, the second scenario is the most probable.

West of the 5th meridian (114 degrees west longitude), 12 cores were logged within this study, but 4 of the cores were found to not represent any interval of the Second White Specks Formation. The remaining 8 cores represent the middle of the basin within Alberta, and are still within the deeper part of the basin, but closer to the paleoshoreline to the east than the core west of the 6th meridian. The core logged within this study represents the basal and middle portions of the Second White Specks Formation within the area, but no core were available that represented the top of the Second White Specks Formation.

The underlying Belle Fourche Formation shales within this location demonstrate a gradual shift into the Second White Specks Formation, and no sharp transitions are observed. This would indicate a slow change into the Second White Specks Formation environment. There is little difference between the two units, aside from a slight increase in reaction to hydrochloric acid and the presence of white specks (coccoliths). Bioturbation is observed within the Belle Fourche of one of the cores, but not in the other cores. This may indicate that this location was less hospitable to organisms, and that sediment became increasingly inhospitable up through into the overlying Second White Specks Formation. The environment of deposition was very low energy and continuous, due to the small grain size observed, and the lack of any sharp contacts. Whole sections of core are represented by unchanging calcareous dark grey shales. The environment remained stable. Minor bentonites are observed indicating volcanic activity within the area. Up section, the environment of deposition of the Second White Specks remains the same. A slight increase in concentration of pyrite and organic matter is observed. Pyrite as nodules and within laminations are observed more frequently than the lower formation. Minor bentonites are observed throughout the middle and upper formation, indicating that rare volcanic activity still occurred within the vicinity.

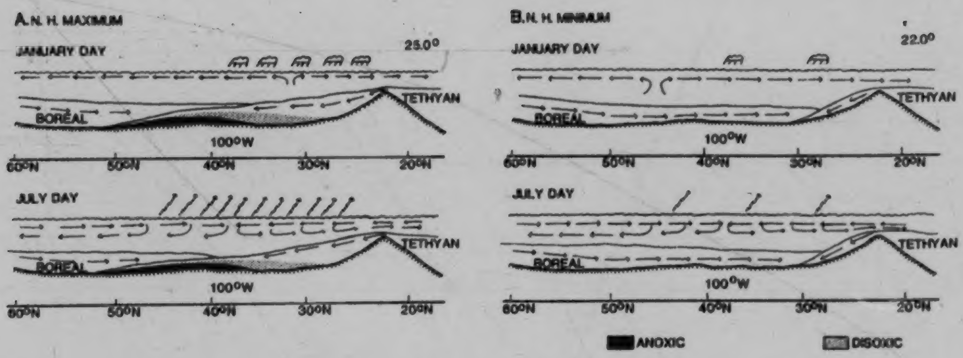
West of the 4th meridian (110 degrees west longitude) and south of the Birch Mountains, 5 cores were logged. These cores represent sediment that was deposited closest to the paleoshoreline within central Alberta. The underlying Belle Fourche Formation in this region is composed of sediments deposited within a low energy environment with minor burrowing. The environment was slightly more oxygenated, and could support a limited biota. The waters were still fairly anoxic, as indicated by the abundant presence of pyrite. Bentonites are often observed throughout the formation, therefore, volcanic activity occurred throughout the deposition of the formation. Bentonites and an organic debris layer are observed at the base of the Second White Specks Formation, but the contact is gradual. Minor pyrite is observed, with abundant organic debris along with no bioturbation, indicating that the waters were anoxic, and inhospitable to organisms. Bentonites continue up section, indicating that volcanism remained active in the area. There is a gradual change into the overlying Carlile Formation, with fine grained shales becoming the dominant lithology, with thin sand laminations and bentonite horizons. The environment appears to return slightly to more oxygenated sediment, as there are minor occurrences of bioturbation in some of the cores near the top of the Second White Specks Formation and into the Carlile formation. The energy of the environment still remained fairly low, as indicated by the fine grained nature of the sediment and the preservation of bentonites.

The core from the Birch Mountains is from a location that would have been the closest to the paleoshoreline during the Cenomanian-Turonian. These cores appear much siltier than the core to the south and east, and most likely represents a slightly higher energy environment that could transport silty shales. Bone beds are observed near the base of the Second White Specks Formation and most likely represent a kill zone. Above this, the energy was low enough to preserve multiple bentonites which do not correlate with the number of bentonites in the southern core. The source of the bentonites is not entirely known, although kimberlite pipes have been found in northeastern Alberta and have been suggested as possible sources for bentonites in the region (Dufresne et al., 2001). The environment was not hospitable to organisms, as no bioturbation was recorded. This is consistent throughout the whole interval of this core.

Sands, from core west of the 6th meridian, are often concentrated into laminations along with fish and shell debris, as well as calcareous white specks. Within the Second White Specks Formation, unidirectional ripples are common and thus indicate a unidirectional current direction. Starved ripples, and often just the cross laminations, are present and indicate that there was very little sand, such that the ripple was slightly eroded on the top. Soft sediment deformation was often observed in the form of loading, flame structures and convoluted bedding (see Plate 3.5 C). Sand, from core west of the 5th meridian, contains minor sand laminations near the base of the Second White Specks Formation, but the percentage is much less than what is observed within the cores to the west. Small scale ripples and the concentration of organic material are also present. The percentage of sand laminations generally increases slightly up the core. Some distorted beds are observed including the presence of loading and small scale ripples. West of the 4th meridian, sand laminations occur frequently throughout the Second White Specks Formation. Coarser grained sediment and organic matter are often concentrated into thin laminations. The sandy laminations are often very fine grained, and ripples and soft sediment deformation are often observed at the top and the base of the formation (see Plates 3.5 A,B and Plate 3.6 A,B,C,D). Minor sandy laminations are observed within core from the Birch Mountains, but do not compare to the concentration observed within the southern core.

Most of the core within the Second White Specks Formation across the study area, contains minor sand within an overall shale package. The shale has been discussed as being deposited within a low energy, anoxic environment. Therefore, the sands were also deposited within this overall environment. Processes which act on the marine floor to move coarser grains include current action, specifically, contour currents. Eriksson and Reczko (1998) define contourites as "lenticular silts and fine sand deposited in deep water on the continental rise, by geostrophic thermohaline currents flowing parallel to bathymetric contours (that) form a significant component of deep marine sedimentation systems." Stow et al. (1996) define two types of contourites: muddy contourites and sandy contourites. The former are much finer grained with less than 15% sand, usually structureless, but may have irregular layering, lamination and lensing. The latter may occur as more irregular beds (<1 to 5 cm) or thicker (5 to 25 cm) that may also be structureless or may demonstrate primary horizontal bedding and cross lamination plus or minus bioturbation. They may also have sharp or gradational bedding contacts (Ibid). These definitions fit what is observed in the Second White Specks Formation, and currents have been historically described as concentrating sediment within the Second White Specks Formation (Bloch et al., 1999). These currents would have enough energy to transport the fine grained sands, white specks, silts and organic debris that are found concentrated into laminations and ripples within the core. The best evidence is provided by the small scale ripples observed, which indicate a unidirectional current produced by the contour currents.

The contourites are a plausible argument for the presence of sands because during the Cenomanian-Turonian there was mixing of much cooler Boreal waters from the north with much warmer waters from the southern Tethyan sea, forming geostrophic thermohaline currents (Figure 3.2). What provides the currents is a difference in density of waters due to temperature and/or salinity variations; this is referred to as thermohaline circulation (Boggs, 1995). With much warmer Tethyan waters intermixing with much cooler Boreal waters, differences in temperature and salinity could produce these bottom currents. These currents were most likely what allowed the movement of coarse grains found within the Second White Specks Formation.


A. N. H. MAXIMUM
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B. N. H. MINIMUM
JANUARY DAY
22.0°
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20°N
JULY DAY
TETHYAN
BOREAL
100°W
60°N
50°N
40°N
30°N
20°N
ANOXIC
DISOXIC

**Figure 3.2:** Cretaceous (91 Ma) deep water circulation patterns within the Western Interior Seaway for the northern hemisphere during the winter and summer. A) Maximum isolation forcing; B) Minimum isolation forcing (from Glancy at al., 1993).

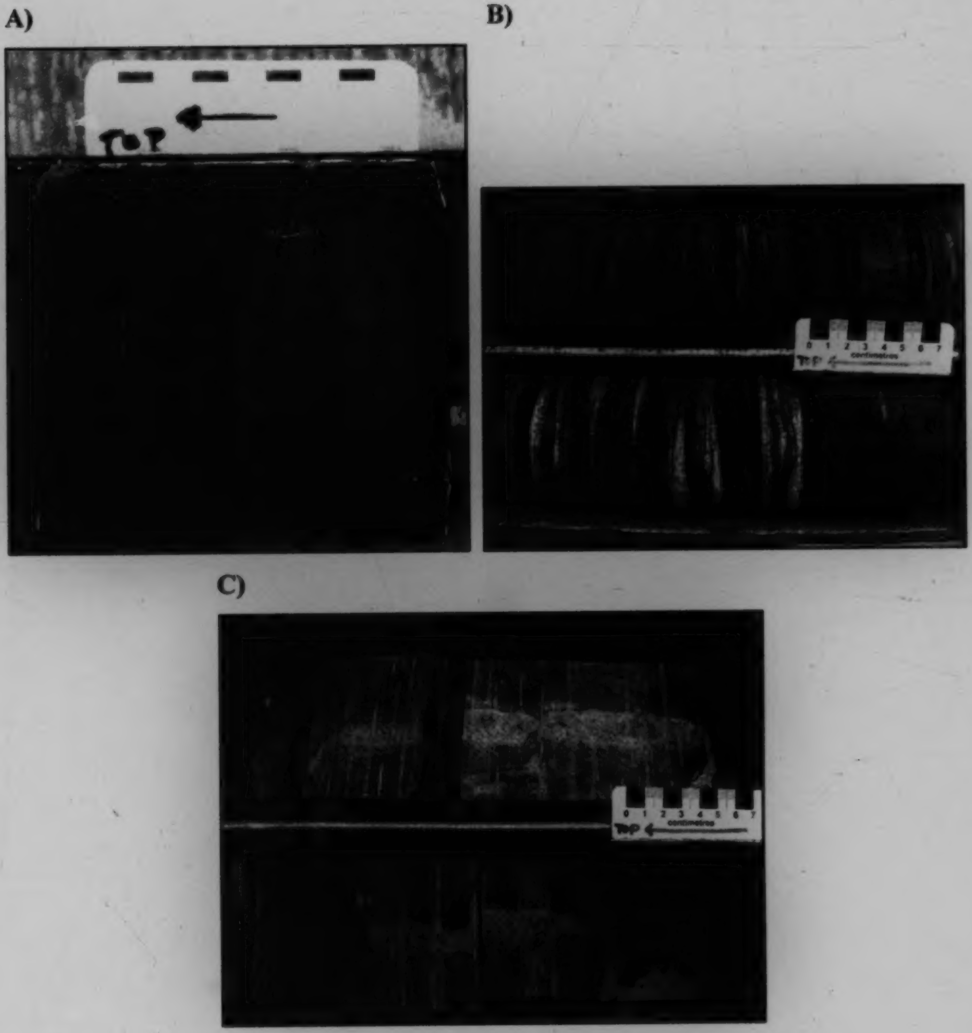

**Plate 3.5:** Photographs of various cores that show evidence of contourites: A) Core from well 00/06-03-061-22W4/0 shows a dark grey shale with silty deformed laminations of sand and ripples, 502.63 m depth; B) Core from well 00/06-35-059-21W4/0 shows abundant dark grey shale with minor concentrations of sand into deformed laminations, 467.34 m depth and C) Core from well 02/06-30-064-01W6/0 shows abundant dark grey shale with minor concentrations of sand into deformed laminations and small ripples, 1557.3 m depth.

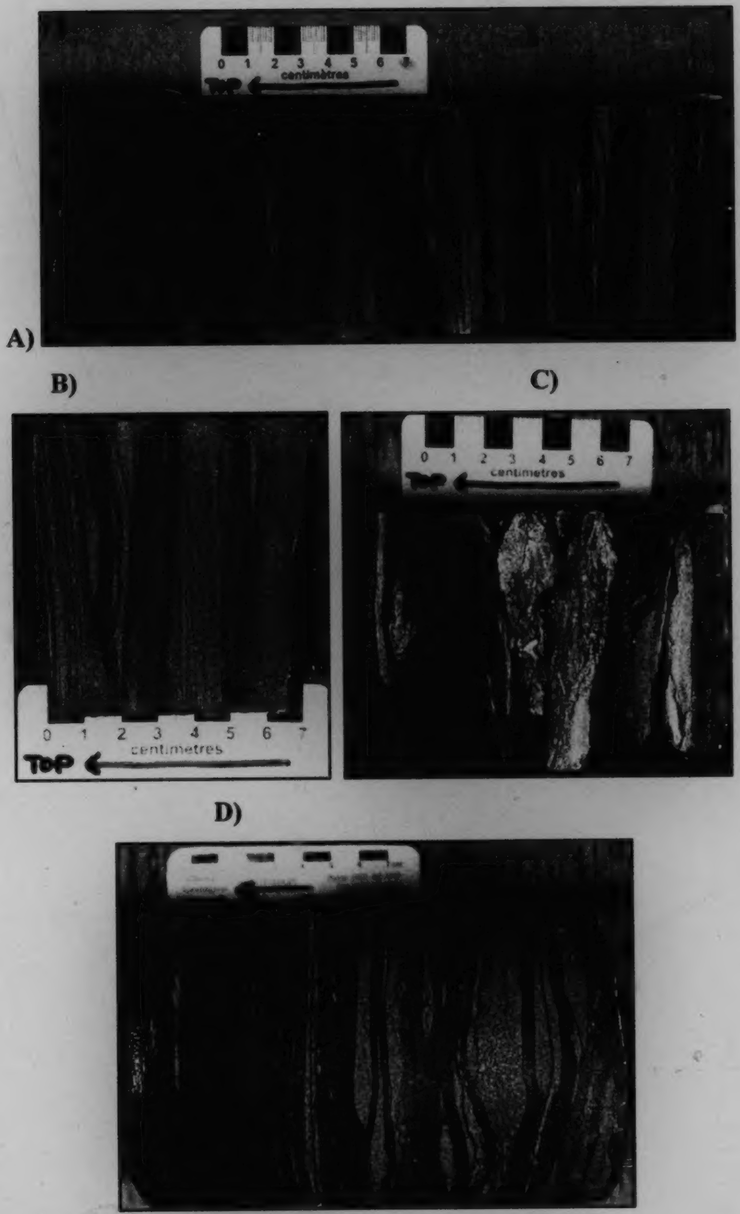

**Plate 3.6:** Photographs of various cores that show evidence of contourites: A) Core from well 00/10-22-047-03W4/0 shows a dark grey shale with small scale sandy ripples, low angle laminations and deformed laminations, 440.89 m depth; B) Close-up of A; C) Core from well 00/10-22-047-03W4 shows concentrated shelly debris lining up with fissility and a bentonite to the right hand side, silty undulatory contacts, 421.63 m depth and D) Core from well 00/10-36-060-22W4/0 shows a section of dark grey shale with deformed laminations and lenses of sand, a few starved ripples, 491.25m depth.

## 3.6 Cross Sections

Six regional cross sections were constructed in total, three dip and three strike sections (Figure 3.3), using the base of the Fish Scales Formation as the datum. A second set of the same cross sections were constructed using the base of the Second White Specks Formation as the datum to better visualize the changes in thickness.

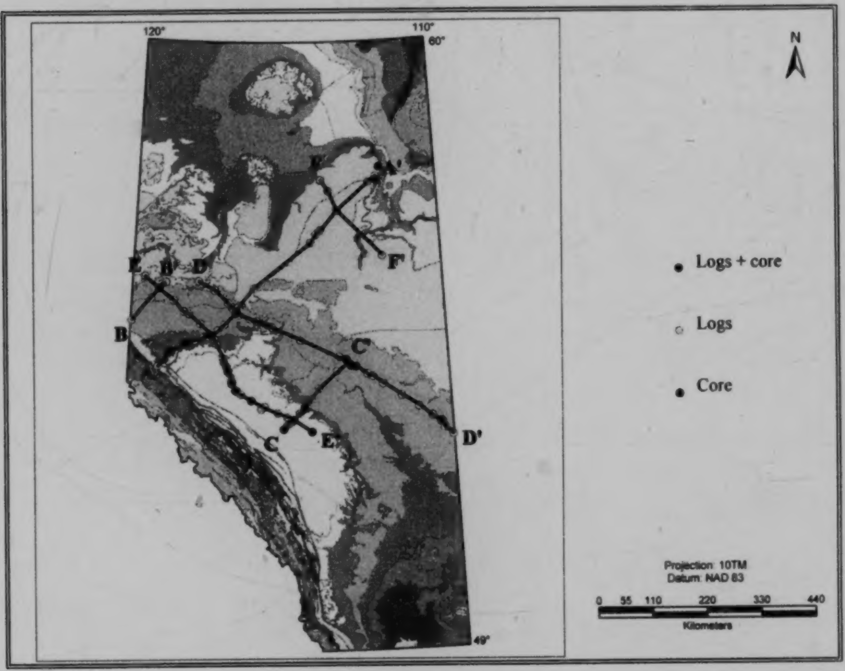
120°
110°
60°
F
A'
F'
E
B'
D
B
C'
C
E'
D'
49°
N
Logs + core
Logs
Core
Projection: 10TM
Datum: NAD 83
0 55 110 220 330 440
Kilometers

**Figure 3.3:** Map of Alberta showing the 6 cross sections constructed in this study. Yellow points show geophysical logs with no core, red points indicate geophysical logs with logged core and blue points indicate logged core with no geophysical logs. Map from the Alberta Geological Survey.

### *3.6.1 Log Characteristics*

One of the difficulties encountered in this study was defining clear characteristics for the identification of the Second White Specks Formation on geophysical logs. This was not always possible, as the physical and hence the geophysical characteristic of the Formation varies widely across the Western Canada Sedimentary Basin.

The basal contact between the Second White Specks Formation and the underlying Belle Fourche Formation generally shows an increase in resistivity and radioactivity into the Second White Specks Formation, whereas the gamma-ray signal is much more variable (Block et al., 1999). This is because of the presence of bentonites. Also, the gamma-ray does not always reflect a change in grain size. While observing the detailed geophysical signature next to the core, the reasons for the variations in the responses are not clear. An explanation for the lack of correlation between the two may be that the sediment within the Second White Specks Formation is higher in organic carbon content and this may have an associated higher concentrations of radioactive material (Leckie et al., 1994, Bloch et al., 1999).

The contact between the top of the Second White Specks Formation and the overlying shales (named the Carlile Formation) shows a decrease in resistivity and sonic velocity as well as a more uniform gamma-ray response within the overlying shale (Bloch et al., 1999).

### *3.6.2 Cross Section A-A'*

**Table 3.1:** Table showing the unique well identifiers for each geophysical log in cross section A-A', whether there is associated core with the geophysical log, and the interval of the Second White Specks Formation.

| **Location:** | **Second White Specks Formation Interval:** | **Thickness:** | **Logged Core (Y/N):** |
|---|---|---|---|
| 00/16-14-059-08W6/0 | 2142m – 2260m | 118m | No |
| 00/14-28-062-05W6/0 | 1873m - ? | 120m? | Yes |
| 00/11-28-063-03W6/0 | 1801m – 1951m | 150m | No |
| 02/16-18-064-02W6/0 | 1659m – 1717m | 58m | Yes |
| 00/07-23-064-02W6/0 | 1585m – 1658m | 73m | No |
| 02/06-30-064-01W6/0 | 1515m - ? | 85m? | Yes |
| 00/02-01-065-27W5/0 | 1552m – 1658m | 106m | No |
| 00/04-27-065-25W5/0 | 1287m – 1407m | 120m | No |
| 00/16-34-065-24W5/0 | 1283m – 1388m | 105m | No |

| | | | |
|---|---|---|---|
| 00/10-09-066-23W5/0 | 1106m – 1235m | 129m | Yes |
| 00/14-12-067-22W5/0 | 914m – 1001m | 87m | No |
| 00/10-20-068-20W5/0 | 885m – 946m | 61m | No |
| 00/04-02-071-18W5/0 | 722m – 740m | 18m | Yes |
| 00/12-12-071-18W5/0 | 703m – 750m | 47m | No |
| 00/10-08-072-17W5/0 | 540m – 610m | 70m | No |
| 00/12-03-076-14W5/0 | 265m – 319m | 54m | No |
| 00/07-21-085-02W5/0 | 220m – 254m | 34m | No |
| 00/06-10-087-01W5/0 | 201m – 275m | 74m | No |
| 00/02-04-088-25W4/0 | 108m – 182m | 74m | No |
| 00/11-08-092-21W4/0 | 99m – 119m | 20m | No |
| W0/12-32-097-14W4/0 | 225m – 257m | 32m | No |
| 00/10-02-099-13W4/0 | 185m – 279m | 94m | No |

This is the longest dip section in this study. It stretches from the deep basin (southwest Alberta) to the Birch Mountains (northeast Alberta) and is 615 km in length. In the deep basin there are many units between the Second White Specks Formation and the base of the Fish Scales Formation. In contrast in northeastern Alberta there is only a thin shale package between the Second White Specks Formation and the base of the Fish Scales Formation; this thin shale is the Belle Fourche Formation.

The Second White Specks unit generally is a wedge shape, thickening to the deep basin and thinning towards the paleoshoreline in north eastern Alberta. The base of the Second White Specks Formation varies from a depth of 2260 m in the southwest to only 279 m at the most northeastern geophysical log. The thickness of the formation varies from over 100 m to less than 20 m. As well, the core from the Birch Mountains (from diamond drill holes 7BK03 and 7AS01) are slightly more northeast than the last geophysical log from oil/gas wells, and are closer to where the Second White Specks crops out. There are local areas that show thickening; these are discussed below (Figure 3.4).

When the base of the Second White Specks Formation is plotted as the datum, it is apparent that there are locations which are thicker than others, with a general thinning towards the northeast (Figure 3.5).

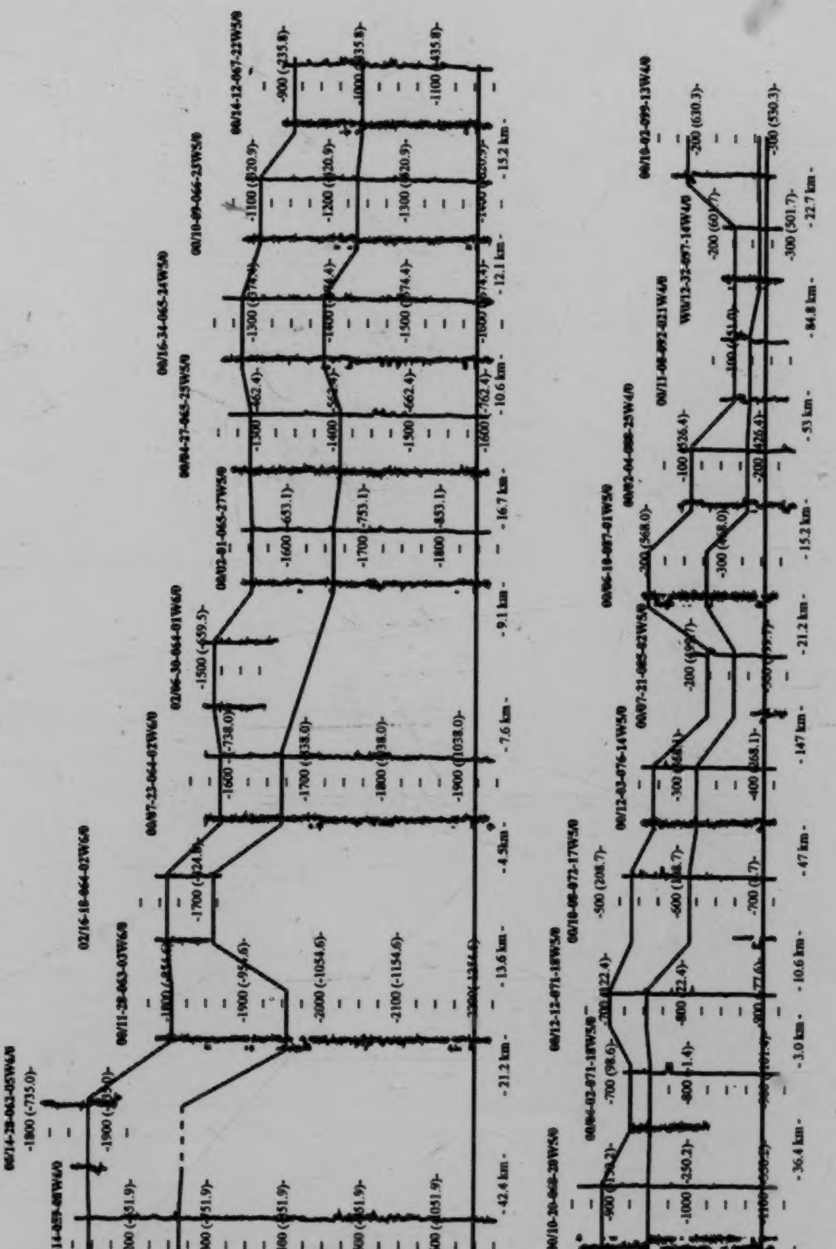
00/16-14-059-08W6/0
00/14-28-063-05W6/0
00/11-28-063-03W6/0
02/16-18-064-02W6/0
00/07-23-064-02W6/0
02/06-30-064-01W6/0
00/02-01-065-27W5/0
00/04-27-065-25W5/0
00/16-34-065-24W5/0
00/10-09-066-23W5/0
00/14-12-067-22W5/0
- 42.4 km -
- 21.2 km -
- 13.6 km -
- 4.5km -
- 7.6 km -
- 9.1 km -
- 16.7 km -
- 10.6 km -
- 12.1 km -
- 15.2 km -
00/10-20-068-20W5/0
00/04-02-071-18W5/0
00/12-12-071-18W5/0
00/10-08-072-17W5/0
00/12-03-076-14W5/0
00/07-21-085-02W5/0
00/06-10-087-01W5/0
00/02-04-088-25W4/0
00/11-08-092-021W4/0
WW/12-32-097-14W4/0
00/10-02-099-13W4/0
- 21.2 km -
- 36.4 km -
- 3.0 km -
- 10.6 km -
- 47 km -
- 147 km -
- 21.2 km -
- 15.2 km -
- 53 km -
- 84.8 km -
- 22.7 km -

**Figure 3.4:** Cross section A-A' with the base of Fish Scales as the datum (bottom line). Notes: The log to the left is always a gamma-ray log, and the log to the right is always a resistivity log for each well. Both logs are not always present for every well. The top two correlations represent the base and top picks for the Second White Specks Formation.

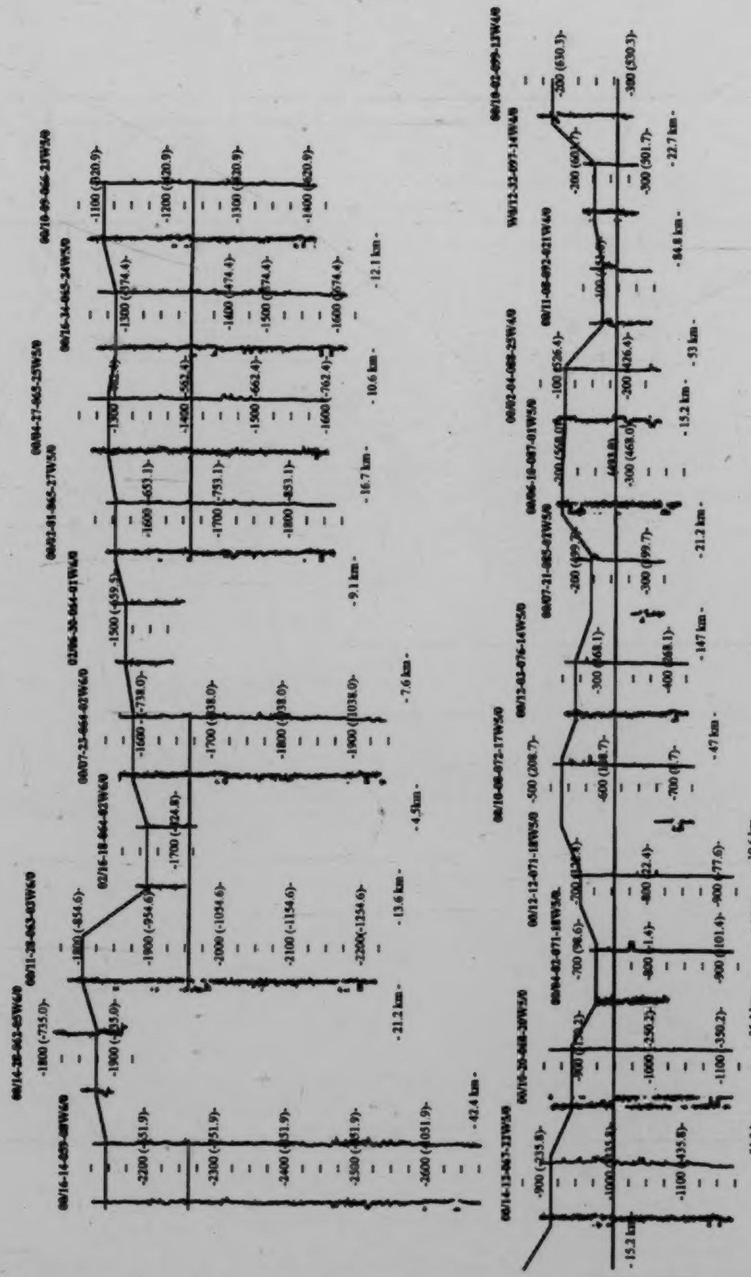
- 42.4 km -
- 21.2 km -
- 13.6 km -
- 4.5km -
- 7.6 km -
- 9.1 km -
- 16.7 km -
- 10.6 km -
- 12.1 km -
- 15.2 km
- 21.2 km -
- 36.4 km -
- 3.0 km -
- 10.6 km -
- 47 km -
- 147 km -
- 21.2 km -
- 15.2 km -
- 53 km -
- 84.8 km -
- 22.7 km -

**Figure 3.5:** Cross section A-A' with the base of the Second White Specks Formation as the datum. Notes: The log to the left is always a gamma-ray log, and the log to the right is always a resistivity log for each well. Both logs are not always present for every well. Correlations are the top and base of the Second White Specks Formation.

### *3.6.3 Cross Section B-B'*

**Table 3.2:** Table showing the unique well identifiers for each geophysical log in cross section B-B', whether there is associated core with the geophysical log, and the interval of the Second White Specks Formation.

| **Location:** | **Second White Specks Formation Interval:** | **Thickness:** | **Logged Core (Y/N):** |
|---|---|---|---|
| 00/11-30-068-13W6/0 | 1596m – 1710m | 114m | No |
| 00/06-19-073-09W6/0 | 718m – 826m | 108m | No |
| 00/16-22-075-08W6/0 | 658m - ? | 80m? | Yes |
| 00/06-20-076-07W6/0 | 423m – 497m | 74m | No |
| 00/11-06-077-06W6/0 | 404m – 449m | 45m | No |

This cross section is a short dip section in north west-central Alberta, and extends from the southwest to the northeast and spans 112 kms in length (Figure 3.6). From the short distance (relative to other cross sections) there is a dramatic shallowing of the unit from southwest to northeast. This is expected for a wedge shaped morphology of the sediments deposited during this time. The thickness ranges from 114 m to 98 m in the most northern core of the section. The dramatic change in depth at the base of the Second White Specks Formation ranges from 1710 m to a much shallower 521 m depth. This is a change of almost 1200 m over a distance of only 112 kms. There are abundant units present in between the base of the Fish Scales Formation marker horizon and the Second White Specks Formation. When the base of the Second White Specks is used as a datum, the wedge shaped morphology of the unit thins towards the northeast (Figure 3.7).

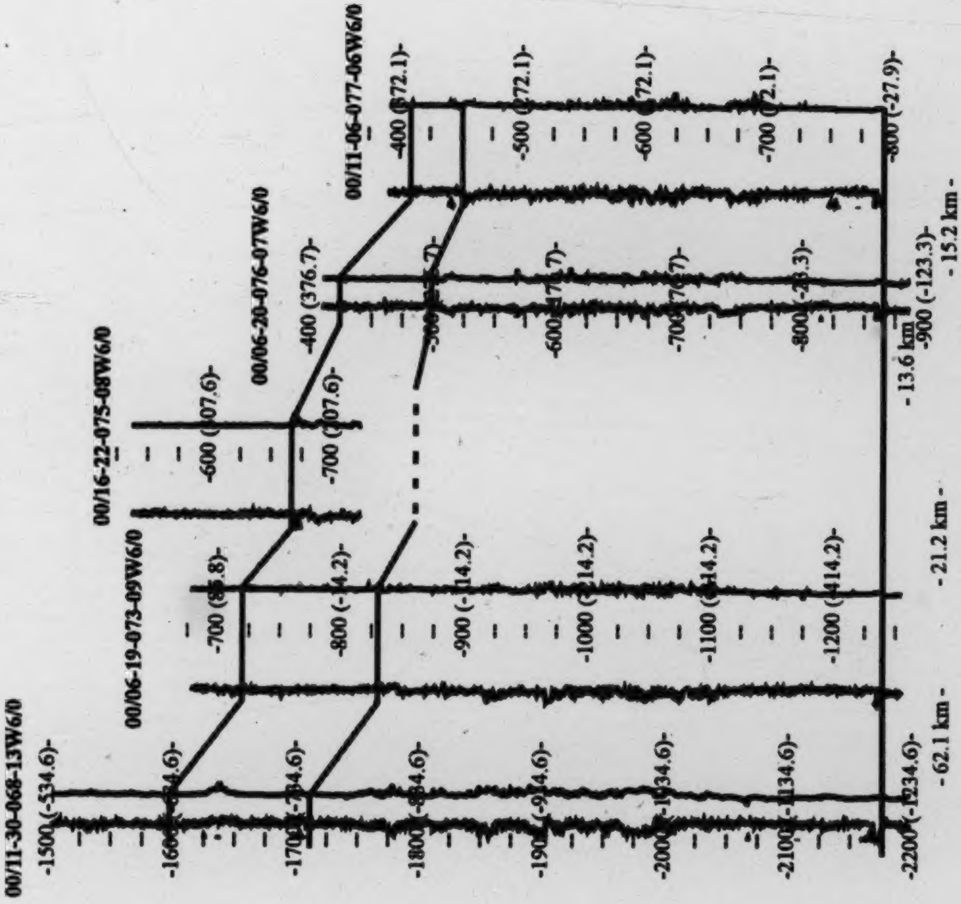
00/11-30-068-13W6/0
00/06-19-073-09W6/0
00/16-22-075-08W6/0
00/06-20-076-07W6/0
00/11-06-077-06W6/0
- 62.1 km -
- 21.2 km -
- 13.6 km
- 15.2 km -

**Figure 3.6:** Cross section B-B' with the base of Fish Scales as the datum (bottom line). Notes: The log to the left is always a gamma-ray log, and the log to the right is always a resistivity log for each well. Both logs are not always present for every well. The top two correlations represent the base and top picks for the Second White Specks Formation.

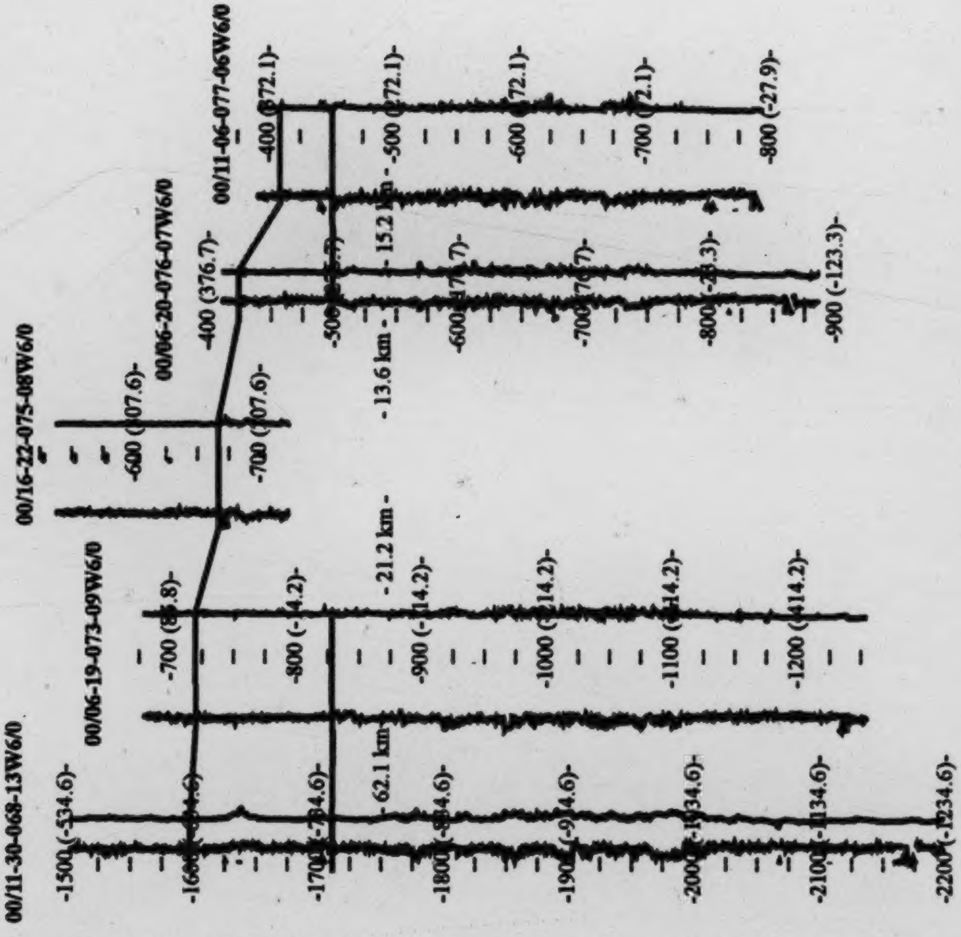
00/11-30-068-13W6/0
00/06-19-073-09W6/0
00/16-22-075-08W6/0
00/06-20-076-07W6/0
00/11-06-077-06W6/0
62.1 km
21.2 km
13.6 km
15.2 km

**Figure 3.7:** Cross section B-B' with the base of the Second White Specks Formation as the datum. Notes: The log to the left is always a gamma-ray log, and the log to the right is always a resistivity log for each well. Both logs are not always present for every well. Correlations are the top and base of the Second White Specks Formation.

### *3.6.4 Cross Section C-C'*

**Table 3.3:** Table showing the unique well identifiers for each geophysical log in cross section C-C', whether there is associated core with the geophysical log, and the interval of the Second White Specks Formation.

| **Location:** | **Second White Specks Formation Interval:** | **Thickness:** | **Logged Core (Y/N):** |
|---|---|---|---|
| 00/06-31-046-08W5/0 | 1782m – 1904m | 122m | Yes |
| 02/06-25-047-08W5/0 | 1573m – 1685m | 112m | No |
| 02/06-14-048-07W5/0 | 1533m – 1622m | 89m | No |
| 00/14-29-048-06W5/0 | 1532m – 1595m | 63m | Yes |
| 00/08-09-050-05W5/0 | 1272m – 1347m | 75m | No |
| 00/05-10-051-04W5/0 | 1202m – 1289m | 87m | Yes |
| 00/09-01-053-03W5/0 | 1021m – 1086m | 65m | No |
| 00/07-10-055-01W5/0 | 873m – 944m | 71m | No |
| 00/14-27-058-24W4/0 | 571m – 612m | 41m | No |
| 00/10-36-060-22W4/0 | 491m – 535m | 44m | Yes |

This is the third and final dip cross section; it extends from central to east-central Alberta and is 187 kms in length (Figure 3.8). Generally, there is a thinning from the deeper basin to the shallower basin, i.e. the unit has a wedge like morphology. This is not shown as clearly as cross section B-B' because there is some local thickening and thinning. With the base of the Fish Scales Formation as the datum, the unit that lies between it and the Second White Specks Formation is the Belle Fourche Formation. This latter formation ranges in thickness from approximately 125m to approximately 45 meters in east-central Alberta. The base of the Second White Specks Formation ranges from approximately 1900m to 535m depth at its shallowest point.

When the base of the Second White Specks Formation is plotted, the thickness generally decreases towards east-central Alberta (Figure 3.9), with locations of thinning, perhaps due to bad picks, basin topography during deposition, contourites concentrating sands and/or tectonics (see following section for the discussion).

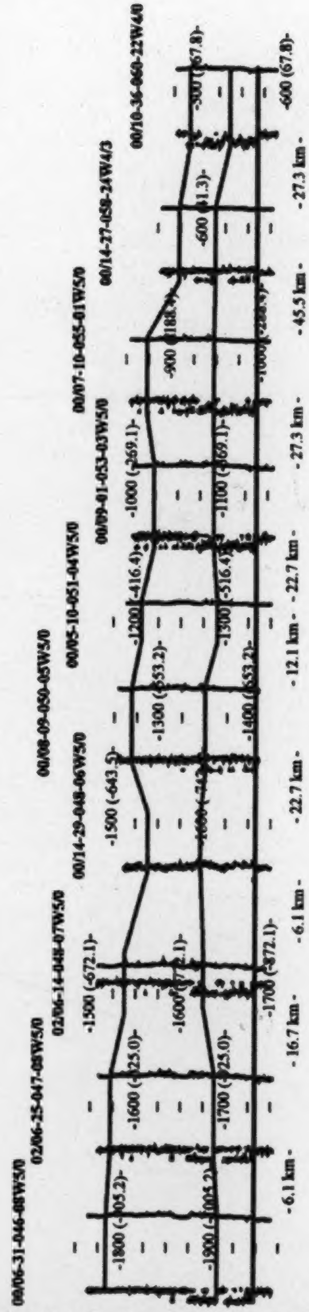
00/06-31-046-08W5/0
02/06-25-047-08W5/0
02/06-14-048-07W5/0
00/14-29-048-06W5/0
00/08-09-050-05W5/0
00/05-10-051-04W5/0
00/09-01-053-03W5/0
00/07-10-055-01W5/0
00/14-27-058-24W4/3
00/10-36-060-22W4/0
-6.1 km -
-16.7 km -
-6.1 km -
-22.7 km -
-12.1 km -
-22.7 km -
-27.3 km -
-45.5 km -
-27.3 km -
-1800 (-905.2)-
-1600 (-825.0)-
-1500 (-672.1)-
-1500 (-643.5)-
-1300 (-553.2)-
-1200 (-416.4)-
-1000 (-269.1)-
-900 (-183.9)-
-600 (-81.3)-
-500 (-67.8)-
-1800 (-1005.2)-
-1700 (-925.0)-
-1600 (-772.1)-
-1400 (-553.2)-
-1300 (-516.4)-
-1100 (-169.1)-
-600 (-67.8)-

**Figure 3.8:** Cross section C-C' with the base of Fish Scales as the datum (bottom line). Notes: The log to the left is always a gamma-ray log, and the log to the right is always a resistivity log for each well. Both logs are not always present for every well. The top two correlations represent the base and top picks for the Second White Specks Formation.

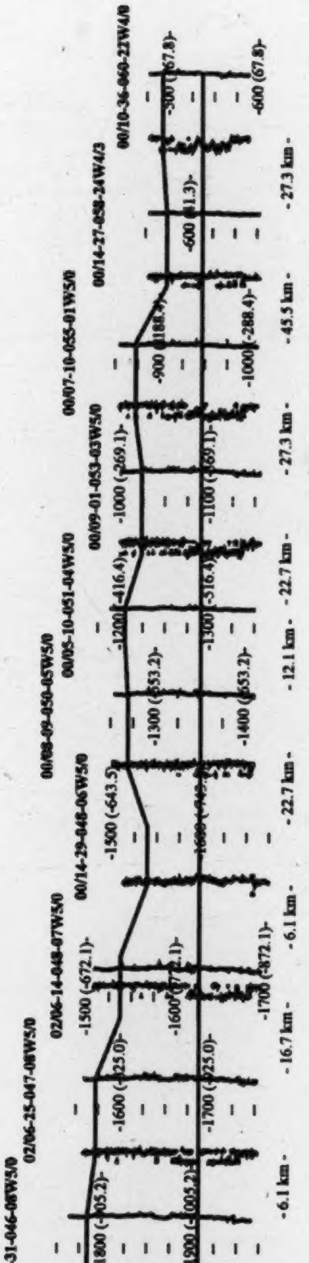
00/06-31-046-08W5/0
02/06-25-047-08W5/0
02/06-14-048-07W5/0
00/14-29-048-06W5/0
00/08-09-050-05W5/0
00/05-10-051-04W5/0
00/09-01-053-03W5/0
00/07-10-055-01W5/0
00/14-27-058-24W4/3
00/10-36-060-22W4/0
6.1 km
16.7 km
6.1 km
22.7 km
12.1 km
22.7 km
27.3 km
45.5 km
27.3 km

**Figure 3.9:** Cross section C-C' with the base of the Second White Specks Formation as the datum.. Notes: The log to the left is always a gamma-ray log, and the log to the right is always a resistivity log for each well. Both logs are not always present for every well. Correlations are the top and base of the Second White Specks Formation.

### *3.6.5 Cross Section D-D'*

**Table 3.4:** Table showing the unique well identifiers for each geophysical log in cross section D-D', whether there is associated core with the geophysical log, and the interval of the Second White Specks Formation.

| **Location:** | **Second White Specks Formation Interval:** | **Thickness:** | **Logged Core (Y/N):** |
|---|---|---|---|
| 00/04-18-077-25W5/2 | 359m – 392m | 33m | No |
| 00/06-21-075-22W5/0 | 274m – 300m | 26m | No |
| 00/06-06-073-19W5/0 | 425m – 470m | 45m | No |
| 00/06-12-072-19W5/0 | 632m – 650m | 18m | No |
| 00/10-20-071-18W5/0 | 624m – 667m | 43m | No |
| 00/04-02-071-18W5/0 | 722m – 740m | 18m | Yes |
| 00/16-19-070-17W5/0 | 725m – 743m | 18m | No |
| 00/03-18-069-13W5/0 | 765m – 783m | 18m | No |
| 00/16-31-067-10W5/0 | 983m – 1014m | 31m | No |
| 00/05-13-065-05W5/0 | 610m – 657m | 47m | No |
| 00/01-32-061-23W4/0 | 521m – 561m | 40m | No |
| 00/06-11-061-22W4/0 | 506m – 553m | 47m | Yes |
| 00/10-36-060-22W4/0 | 491m – 535m | 44m | Yes |
| 00/06-10-060-21W4/0 | 469m – 510m | 41m | No |
| 00/03-16-060-21W4/0 | 467m – 508m | 41m | No |
| 00/06-35-059-21W4/0 | 463m – 504m | 41m | Yes |
| 00/07-36-059-21W4/2 | 447m – 497m | 50m | No |
| 00/06-26-059-20W4/0 | 447m – 486m | 39m | Yes |
| 00/11-01-058-18W4/0 | 421m – 460m | 39m | No |
| 00/09-24-057-17W4/2 | 399m – 441m | 42m | No |
| 00/16-31-055-14W4/0 | 400m – 438m | 38m | No |
| 00/11-14-053-11W4/0 | 476m – 499m | 20m | No |
| 00/10-31-050-07W4/0 | 394m – 415m | 21m | No |
| 00/16-35-048-05W4/0 | 425m – 445m | 20m | No |
| 00/10-22-047-03W4/0 | 426m – 440m | 14m | Yes |
| 00/01-18-046-02W4/0 | 431m – 445m | 14m | No |
| B0/07-25-044-01W4/0 | 373m – 385m | 12m | No |

This is a strike cross section, following the strike of the Foothills. The section is from the northwest to the southeast portion of the study area. Generally, the unit thins towards the southeast, with the depths remaining fairly constant. There is a slight deepening in the center of the cross section to depths of approximately 1000 m. The greatest depth for the base of the Second White Specks Formation in this cross section is

1014 m. The shallowest is 385 m depth in east-central Alberta. In northwestern Alberta, there are multiple units between the base of the Fish Scales Formation and the base of the Second White Specks Formation. Further east, the Belle Fourche Formation is the only formation between the two. The thickness ranges from approximately 125 m to less than 20 m. The first log 00/04-18-077-25W5/2 may have been picked incorrectly because it does not seem to correlate well with the other logs, or something structural may not be observed. More geophysical logs would be needed to increase the resolution of this part of the cross section. The cross section spans 639 km in length (Figure 3.10).

When the base of the Second White Specks Formation is used as a datum, the thickness of the formation seems to be thinning towards the edges of the cross section. It is the thickest in the central part of the section. Generally, this is a gradual change that may represent the central part of the Western Canada Sedimentary basin at the time of deposition and structural elements (discussed below). This would be the area with the most accommodation and potential to accumulate thicker packages of sediment (Figure 3.11).

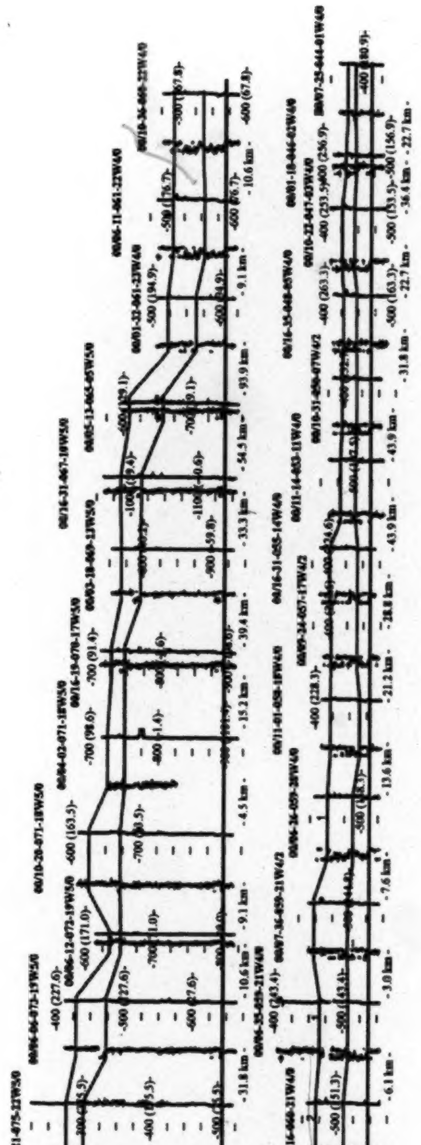

**Figure 3.10:** Cross section D-D' with the base of Fish Scales as the datum (bottom line). Notes: The log to the left is always a gamma-ray log, and the log to the right is always a resistivity log for each well. Both logs are not always present for every well. The top two correlations represent the base and top picks for the Second White Specks Formation.

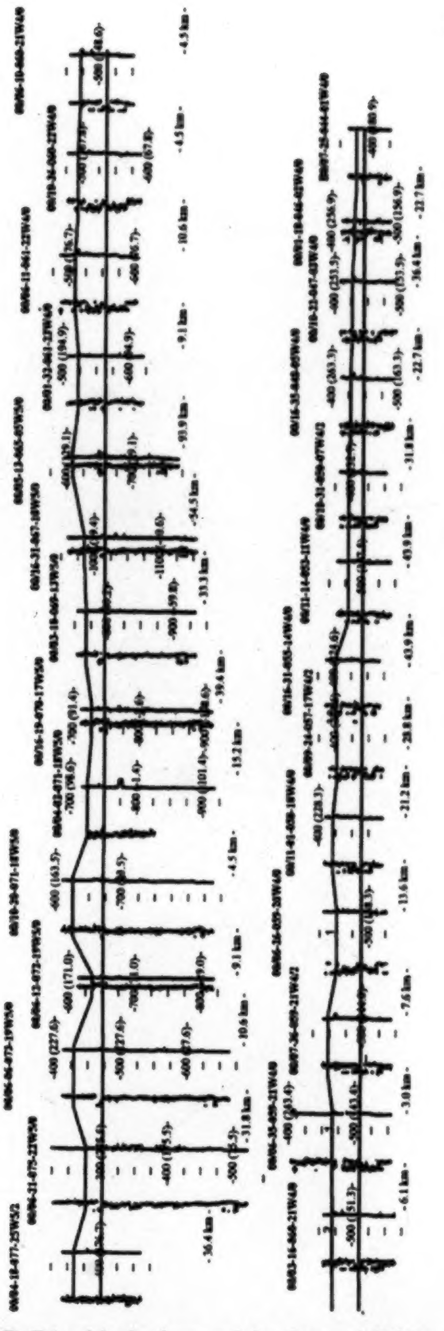

**Figure 3.11:** Cross section D-D' with the base of the Second White Specks Formation as the datum.. Notes: The log to the left is always a gamma-ray log, and the log to the right is always a resistivity log for each well. Both logs are not always present for every well. Correlations are the top and base of the Second White Specks Formation.

### *3.6.6 Cross Section E-E'*

**Table 3.5:** Table showing the unique well identifiers for each geophysical log in cross section E-E', whether there is associated core with the geophysical log, and the interval of the Second White Specks Formation.

| **Location:** | **Second White Specks Formation Interval:** | **Thickness:** | **Logged Core (Y/N):** |
|---|---|---|---|
| 00/08-03-078-11W6/2 | 341m – 427m | 86m | No |
| 00/16-22-075-08W6/0 | 658m – ? | 80m? | Yes |
| 00/07-11-073-05W6/0 | 651m – 696m | 45m | No |
| 00/14-01-071-03W6/0 | 740m – 808m | 68m | No |
| 00/12-19-070-01W6/0 | 773m – 838m | 65m | No |
| 00/14-20-068-25W5/0 | 910m – 986m | 76m | No |
| 00/10-09-066-23W5/0 | 1106m – 1235m | 129m | Yes |
| 00/11-18-065-22W5/0 | 1216m – 1319m | 103m | No |
| 00/10-16-064-22W5/0 | 1302m – 1393m | 91m | No |
| 00/04-23-061-21W5/0 | 1633m – 1739m | 106m | No |
| 00/08-25-060-21W5/0 | 1685m – 1792m | 107m | No |
| 00/10-28-059-20W5/0 | 1787m – 1906m | 119m | Yes |
| 02/16-27-058-20W5/0 | 1772m – 1856m | 84m | Yes |
| 02/16-19-057-19W5/0 | 2024m – 2111m | 87m | No |
| 00/09-09-056-19W5/0 | 2198m – 2282m | 84m | Yes |
| 00/02-28-054-18W5/0 | 1964m – 2094m | 130m | No |
| 00/10-31-054-18W5/0 | 2037m – 2075m | 138m | Yes |
| 00/10-05-054-17W5/0 | 1957m – 2086m | 129m | No |
| 02/07-33-052-15W5/0 | 1880m – 1955m | 75m | Yes |
| 00/06-03-051-13W5/0 | 1948m – 2050m | 102m | No |
| 00/15-20-051-12W5/0 | 1912m – 1973m | 61m | No |
| 00/10-12-050-10W5/0 | 1704m – 1796m | 92m | No |
| 02/16-14-049-08W5/0 | 1565m – 1655m | 90m | No |
| 00/14-29-048-06W5/0 | 1532m – 1595m | 63m | Yes |
| 00/16-12-046-03W5/0 | 1474m – 1552m | 78m | Yes |

This cross section is the most westerly cross section in the study. It therefore represents the deepest location of sedimentation. It also strikes southeasterly parallel to the direction of the Alberta Foothills. The thickest package of Second White Specks Formation sediments lies in the center of the cross section, which is also apparent in cross section D-D'. The thickness is less variable than the previous cross section, varying from approximately 50 m to 100 m. In northwestern Alberta, there is a great vertical distance between the base of the Fish Scales Formation and the Second White Specks Formation;

this is due mainly to many subdivisions between the two, whereas moving more southeasterly, only the Belle Fourche Formation lies between the two formations. There are a few areas of local thinning, but, overall the change in thickness across the cross section is fairly gradual. The base of the Second White Specks Formation ranges from a depth of 2282 m in the center of the cross section and the basin, to much shallower depths on the flanks (Figure 3.12). The shallowest depth in this cross section is in northwestern Alberta where the base is only at 427 m depth. The cross section is 484 kms in length.

When the base of the Second White Specks Formation is used as the datum for the cross section, the thickest parts of Second White Specks Formation are within the central portions of the cross section, which also corresponds with the deeper basin. The thinnest location is in northwestern Alberta. In general, there are a few local areas of thinning, but the thickness remains fairly constant southeastwards (Figure 3.13).

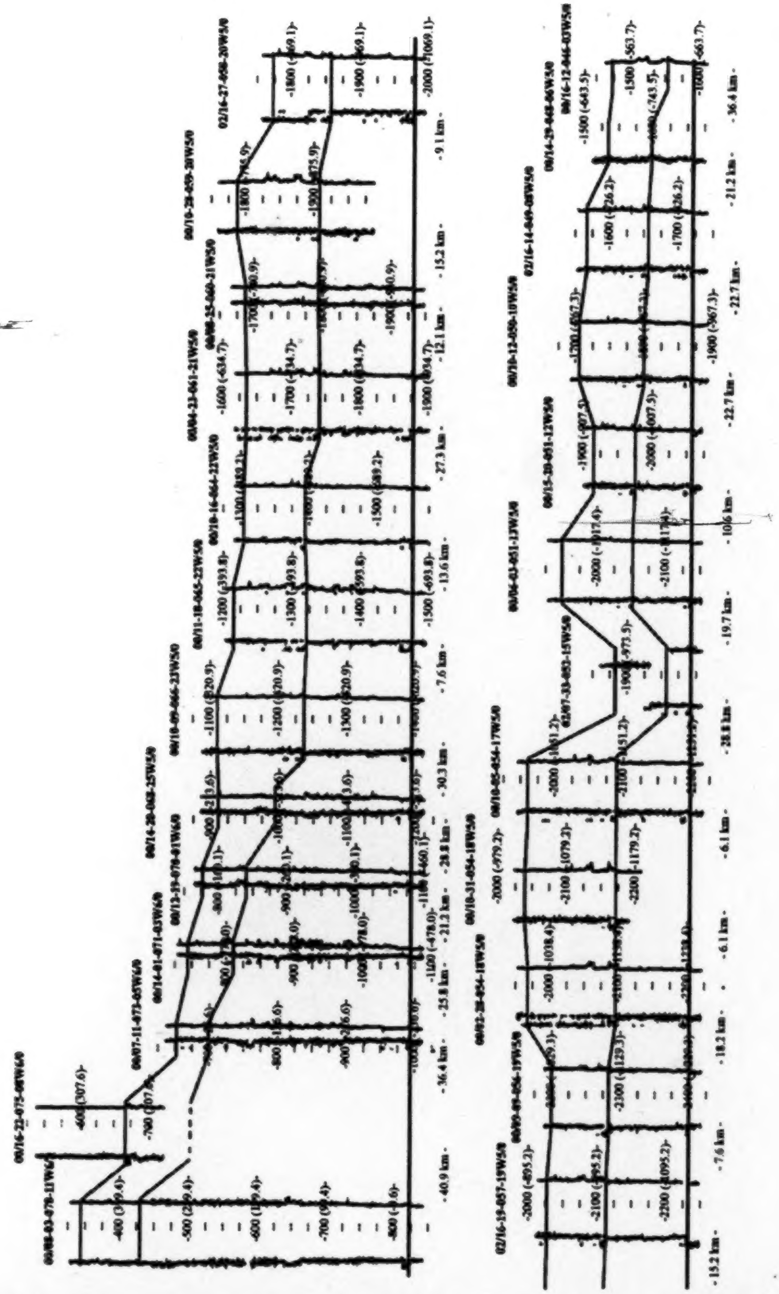

**Figure 3.12:** Cross section E-E' with the base of Fish Scales as the datum (bottom line). Notes: The log to the left is always a gamma-ray log, and the log to the right is always a resistivity log for each well. Both logs are not always present for every well. The top two correlations represent the base and top picks for the Second White Specks Formation.

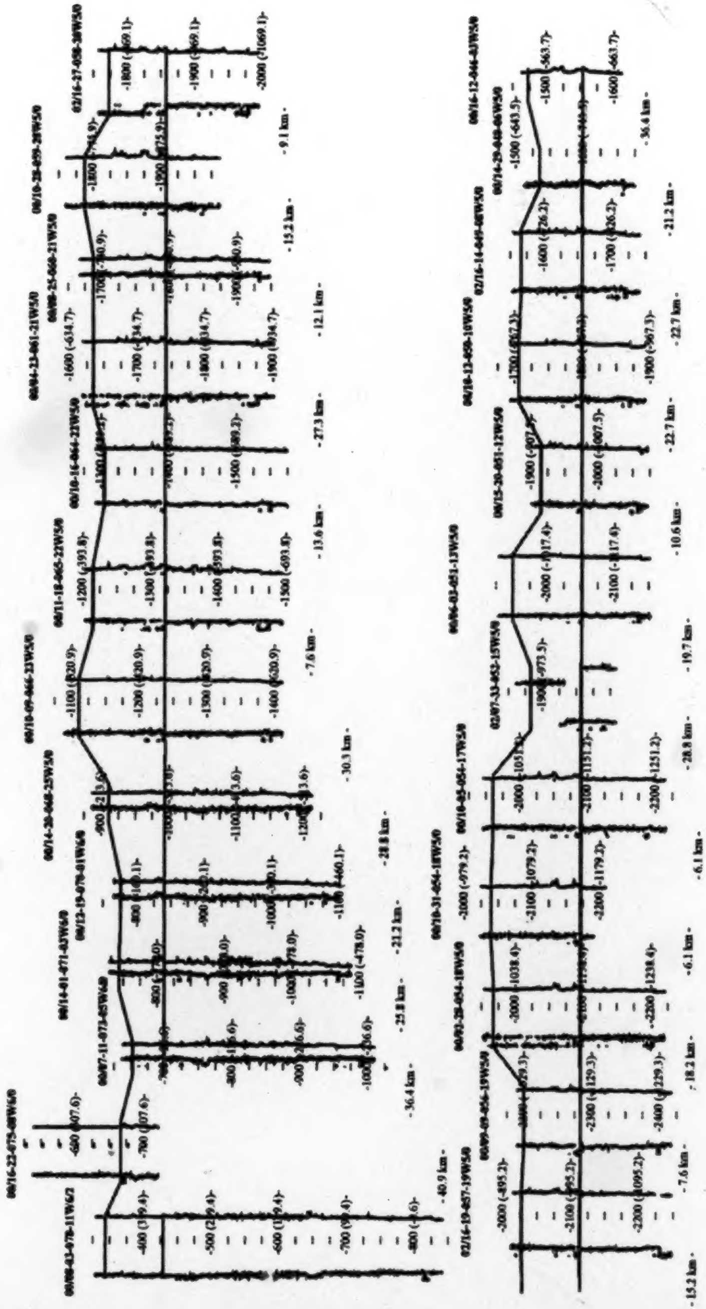

**Figure 3.13:** Cross section E-E' with the base of the Second White Specks Formation as the datum. Notes: The log to the left is always a gamma-ray log, and the log to the right is always a resistivity log for each well. Both logs are not always present for every well. Correlations are the top and base of the Second White Specks Formation.

### *3.6.7 Cross Section F-F'*

**Table 3.6:** Table showing the unique well identifiers for each geophysical log in cross section F-F', whether there is associated core with the geophysical log, and the interval of the Second White Specks Formation.

| **Location:** | **Second White Specks Formation Interval:** | **Thickness:** | **Logged Core (Y/N):** |
|---|---|---|---|
| 00/11-17-098-24W4/0 | 215m – 231m | 16m | No |
| 00/06-11-096-23W4/0 | 177m – 194m | 17m | No |
| 00/11-08-092-21W4/0 | 99m – 119m | 20m | No |
| 00/15-13-082-13W4/0 | 116m – 136m | 20m | No |

This cross section is the most northeasterly strike section. There was no logged core in this cross section, therefore, it must be noted that none of the geophysical logs have been confirmed using dating techniques or core. The thickness remains fairly constant and is very thin compared to the previous cross sections which are approximately 20 m in thickness. The deepest location of the base of Second White Specks is in the most northwestern core, at 231 m depth. The shallowest section is in the southeast at 119 m depth. The cross section is 96 kms in length (Figure 3.14).

When the base of the Second White Specks Formation is used as a datum, the thickness of the formation increases slightly towards the southeast. The change is negligible compared to the previous cross sections (Figure 3.15).

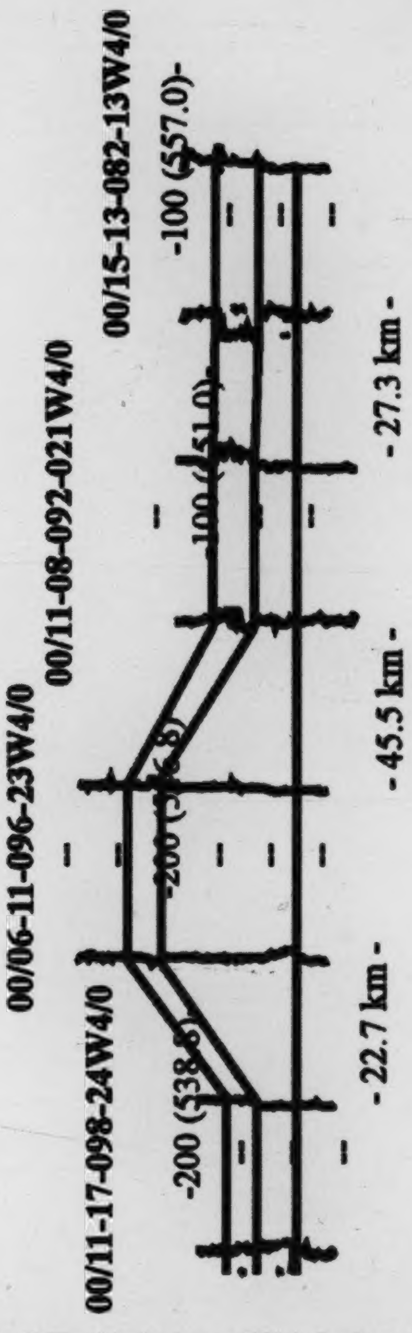
00/11-17-098-24W4/0
-200 (538.6)
00/06-11-096-23W4/0
-200 (5[illegible]6.8)
00/11-08-092-021W4/0
-100 (551.0)
00/15-13-082-13W4/0
-100 (557.0)
- 22.7 km -
- 45.5 km -
- 27.3 km -

**Figure 3.14:** Cross section F-F' with the base of Fish Scales as the datum (bottom line). Notes: The log to the left is always a gamma-ray log, and the log to the right is always a resistivity log for each well. Both logs are not always present for every well. The top two correlations represent the base and top picks for the Second White Specks Formation.

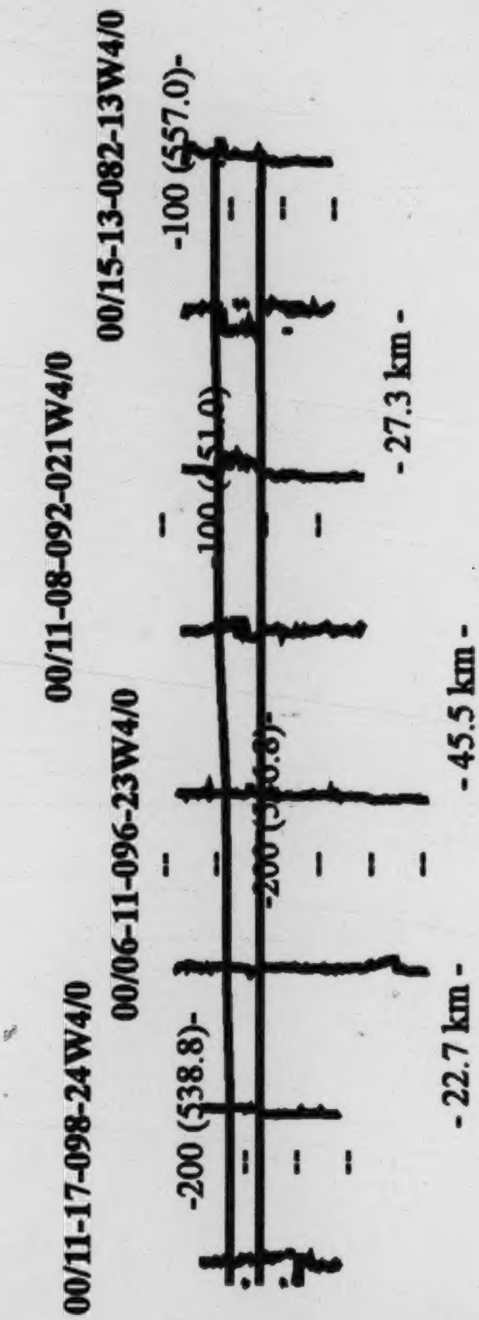
00/15-13-082-13W4/0
-100 (557.0)-
00/11-08-092-021W4/0
-100 (551.0)
- 27.3 km -
00/06-11-096-23W4/0
-200 (5?6.8)-
- 45.5 km -
00/11-17-098-24W4/0
-200 (538.8)-
- 22.7 km -

**Figure 3.15:** Cross section F-F' with the base of the Second White Specks Formation as the datum. Notes: The log to the left is always a gamma-ray log, and the log to the right is always a resistivity log for each well. Both logs are not always present for every well. Correlations are the top and base of the Second White Specks Formation.

### *3.6.8 Cross Section and Thickness Variations Discussion*

There are a few explanations for the variation in thickness. Firstly, some of the picks were difficult to choose and may not be correct. Secondly, the basin topography may have been variable resulting in local areas of thickening and thinning. Local lows allow a thicker sediment package to accumulate and local highs allow thinner sediment packages to be preserved, which is often observed with Cretaceous sediments due to underlying carbonate formations (highs where there are Devonian reefs, lows in inter-reef zones) and salt dissolution (Wright, 1994) . Thirdly, there may have been structural elements involved which are discussed below. Fourthly, the location and frequency of the geophysical logs may not be showing the resolution needed. Fifthly, there was the action of contourites, moving sands and accumulating sands preferentially, causing slightly thicker packages of sediment to be preserved in some places and eroding other locations. The effects of contourites are discussed in Section 3.5.

Structural control includes basement faults, propagated into the overlying Phanerozoic as well as the third option, structural features, have been noted elsewhere affecting sedimentation thickness within the Cretaceous (Wright, 1994). Salt and carbonate dissolution, specifically the dissolution of Devonian salt which has been postulated to cause variations in the thickness of Cretaceous sediment Ibid, 1994. Variations in thickness in northeastern Alberta have been noted and may be due to present day erosion of positive structures (Wright, 1994) such as the Birch Mountains. During the formation of the foreland basin, a forebulge was present, and was migrating during the time, possibly causing thickness variations. Movement along pre-existing fault planes in the basement also was occurring and most likely caused thickening and thinning. Pana (2001) noted that subsidence of the Peace River arch was occurring from the earliest Cretaceous, controlling structure in the area and thus may have caused thickening of the Second White Specks. He (Ibid) noted that during the Albian to Cenomanian there were affects on the depositional trends due to intermittent uplift and subsidence of the Cordilleran orogeny and the Peace River Arch. Thickness variations have also been noted in previous studies, such as Bloch et al. (1993), where a cross section of the Second White Specks Formation varies in thickness up to 25m but does not address why this variation was observed.

An isopach map of the Second White Specks Formation (Figure 3.16) demonstrates that, generally, the Second White Specks has a wedge shape geometry and thickens towards the mountains. Within the Birch Mountains, there is a large thickness variation, which is most likely due to erosion and exposure of the shale. There also is abrupt local thickening and thinning within the middle of the study area; this may or may not be real and needs to be resolved with more well control. Having said this, based on the information available, this irregular thickening and thinning may be due to salt dissolution of older strata, causing the sea floor to be irregular and preferentially having caused local areas of accommodation for the sediment to accumulate and possibly also the activation of faults.

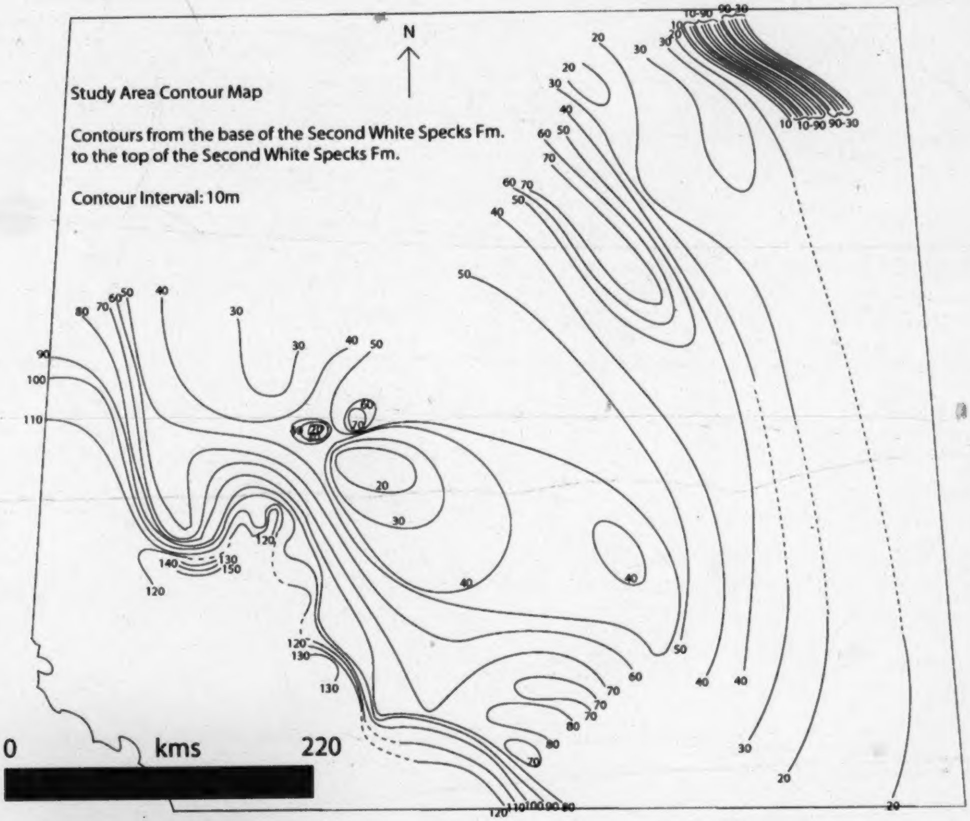
N
Study Area Contour Map
Contours from the base of the Second White Specks Fm.
to the top of the Second White Specks Fm.
Contour Interval: 10m
0
kms
220

**Figure 3.16:** Isopach map of the thickness of the Second White Specks Formation across the study area. Contour interval of 10 m.

### 3.7 Sequence Stratigraphy

The depositional system for the Second White Specks Formation may be classified as shallow marine (shelf-type setting). Many authors agree (Possamentier and Allen, 1999, Catuneanu, 2003) that, because of the distal location of the deeper marine from the sediment entry points, the deeper marine deposits are the most difficult to study using sequence stratigraphy. Catuneanu (2003) also noted the fact that there is often a lack of connection between the sediment entry points and the sedimentation site, and condensed sections may develop. This is made even more difficult with the Second White Specks Formation due to the fact that the gamma-ray response often does not always reflect grain size changes. Instead, higher values on the gamma-ray logs are often produced by bentonites or organic matter.

The Second White Specks Formation was deposited during an overall sea level highstand, therefore, little sediment was being transported to the distal deeper marine environment. As the gamma ray response is not a reliable source for grain size changes in this study, the maximum flooding surface is tentatively placed at the base of the Second White Specks Formation, where a bentonite bed and a bone bed are often observed. The bone bed most likely represents a kill zone that was deposited during the connection of the southern and northern oceans. It is noted that bioturbation is observed within the underlying Belle Fourche Formation, indicating that sediments were more oxygenated; in contrast, no bioturbation is observed at the base or the middle of the Second White Specks Formation, indicating that the environment became anoxic and inhospitable for the organisms. This point is reinforced by the micropaleontology in that planktic foraminifera occur only within the Second White Specks Formation, presumably when the Boreal and Tethyan waters were intermixing and during the maximum flooding surface. The maximum flooding surface signals the end of the transgressive systems tract.

After the maximum flooding surface at the base of the Second White Specks Formation, the highstand systems tract begins while sea level continues to rise and deposits the remaining Second White Specks Formation. The bottom waters remain anoxic, but gradually return to more normal marine conditions during the deposition of the overlying Carlile Formation.

Within this shallow marine environment, three processes can cause the aggradation of clastic sediments; these comprise; (1) gravity flows; (2) contour currents; and, (3) pelagic sedimentation (Catuneanu, 2003). The pelagic sedimentation occurs throughout base level rise and fall, and primarily deposits the shales themselves throughout the Second White Specks Formation. As mentioned above, however, sands are present in some cores from the study area. These sands were most likely brought to the deeper locations of the Western Interior Seaway by contour currents. The fine grained nature of the sediments, and the low proportion of sand, along with sedimentary current flow structures such as small scale ripples, indicate that there was mainly unidirectional flow. The most probable cause of the concentration of these sands, silts, organic debris and white specks is contour currents acting on the base of the sea floor. Finally, the activity of gravity flows is negligible in the cores studied because no turbidite sequences were observed.

### 3.8 Discussion

The Second White Specks was deposited within an overall sea level high within the western Interior seaway. The top of the underlying Belle Fourche was deposited during transgression, while sea level was rising, but sediments were largely anoxic but locally slightly oxygenated, allowing for organisms to inhabit the sediment in locations. As sea level continued to rise, warm waters from the Tethyan ocean began to connect to the cooler waters of the Boreal ocean (see Figure 3.17). During this peak in transgression, the maximum flooding surface was attained, and this was the start of deposition of the Second White Specks Formation. This maximum flooding surface is marked by a bioclastic layer, where shells and fish debris are deposited. During this time, coccoliths appear within the formation. This also marks the first instance of planktic foraminifera and a decrease in the abundance of benthic foraminifera, due to the bottom waters becoming more anoxic and inhospitable to organisms. No bioturbation is observed close to the maximum flooding surface.

The basin topography during this time was most likely undulatory due to fault movements and dissolution of underlying evaporites, but has a general wedge shaped geometry, thickening towards the west, where loading of the foreland basin was occurring. The Second White Specks Formation, therefore, has a general wedge shaped geometry, with local areas of thickening and thinning. Because of the mixing of oceans, currents moved long the sea floor, carrying and concentrating very fine sands, silts, coccoliths and organic debris into fine laminations and ripples.

The sea level continued to rise during the following highstand. The environment of deposition varied slightly across the study area. Within the deep basin, and possibly to the east due to the abundance of preserved organic matter (Figure 3.17), a low energy, anoxic environment accumulated fine grained sediment as shales. Within northeastern Alberta, the energy was still fairly low, but energetic enough to deposit slightly coarser sediment in the form of silty shales. This location may even have been slightly restricted from the rest of the basin because of the palynology observed and the coarser grained sediment. Throughout the basin, contour currents transported fine grained sediment throughout the Second White Specks Formation. This is indicated by the presence of thin laminations within the shales. These currents also concentrated organic matter and shell debris from the sea floor into thin laminations and lenses. The influence of currents varied, depositing more sands in some locations and less in others throughout the deposition of the Second White Specks Formation. It appears as though the influence of currents was stronger during the start of highstand, and then decreases slightly closer the top of the Second White Specks Formation.

Across the study area, general anoxia during the highstand continued for a long period, but then the sediment became slightly more oxygenated as evidenced by bioturbation at the top of the Second White Specks Formation in some core. The low energy depositional environment continued during the start of deposition of the overlying Carlile Formation, but as time progressed normal marine conditions started to return.

Volcanism was present during the deposition of the Second White Specks Formation, depositing bentonites across the basin. In general, it is probable that most of the volcanism of the west in what is now the British Columbia accreted terranes, and volcanic ash was transported easterly via winds to accumulate in the Second White Specks Formation. However, it appears as though local volcanism may have occurred within the Birch Mountains area, due to the unusual local abundance of bentonites in the area.

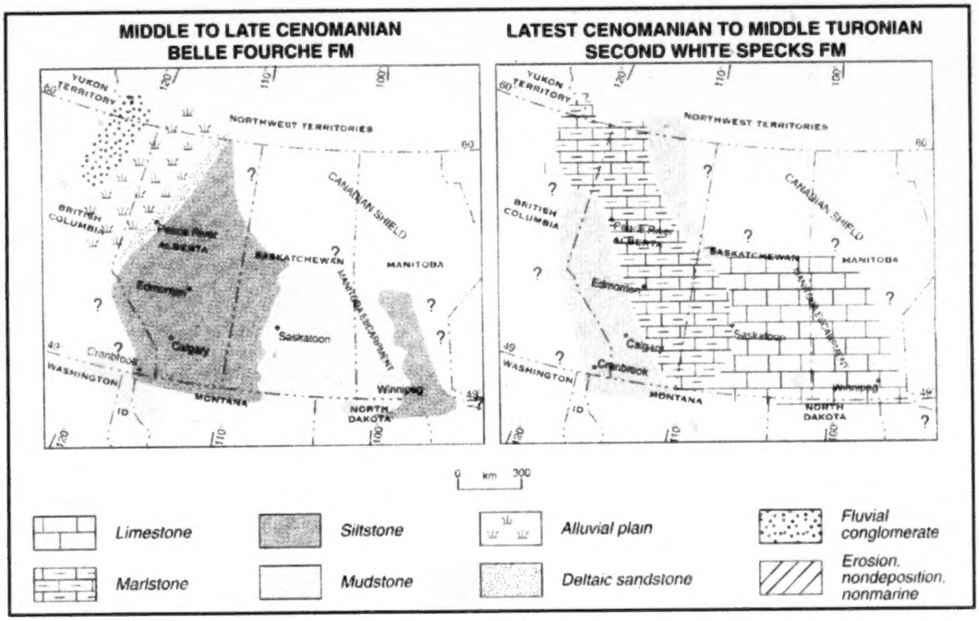
MIDDLE TO LATE CENOMANIAN
BELLE FOURCHE FM
LATEST CENOMANIAN TO MIDDLE TURONIAN
SECOND WHITE SPECKS FM
YUKON TERRITORY
NORTHWEST TERRITORIES
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
CANADIAN SHIELD
MANITOBA ESCARPMENT
Peace River
Edmonton
Calgary
Cranbrook
Saskatoon
Winnipeg
WASHINGTON
ID
MONTANA
NORTH DAKOTA
120
110
100
60
49
0 km 300
Limestone
Marlstone
Siltstone
Mudstone
Alluvial plain
Deltaic sandstone
Fluvial conglomerate
Erosion, nondeposition, nonmarine

**Figure 3.17:** Paleoenvironmental maps for the Belle Fourche and the Second White Specks Formation (from Bloch et al., 1999).

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# 4.0 THE GEOCHEMISTRY OF THE ORGANIC RICH SECOND WHITE SPECKS FORMATION, NORTH/CENTRAL ALBERTA

## 4.1 Introduction

The organic geochemistry of the Second White Specks Formation has been well documented because it has been of interest to exploration companies, as a result of it being both a source and reservoir rock, (Leckie et al., 1994). However, little work has been published on the inorganic geochemistry and metalliferous economic potential of the formation.

Information about the organic geochemistry of the Second White Specks Formation is common. For example, Travis (2002) demonstrated that the Second White Specks Formation has a high total organic carbon content, Type II kerogen, early maturity and fair to very good hydrocarbon potential in central/western Alberta (west of Edmonton). Travis (Ibid) concluded that the formation has the potential for shale gas production within Alberta. Other workers have generally agreed that the dominant organics are Type II marine organic matter within the Second White Specks Formation (Leckie et al., 1994, Bloch et al., 1999). The total organic carbon content has been recorded as reaching a maximum of 12 wt%, and has a much higher total organic carbon content than either the underlying Belle Fourche or the overlying Carlile formations (Bloch et al., 1999). Investigations by Bloch et al. (1999) have demonstrated that the Second White Speckled Shale is a mature source rock west of 114° longitude, where the migration of hydrocarbons most likely occurred through fractures. Snowdon (1995) described rock-eval $T_{max}$ suppression for the Second White Specks Formation, and stated that below 453°C, the suppression is around 1°C for each increase in the hydrogen index of 50 mg hydrocarbon/g total organic carbon content.

On the inorganic side, a report was completed by the Alberta Geological Survey/Alberta Energy and Utilities Board and Tintina Mines Limited (Dufresne et al., 2001, Sabag, 1996) which investigated various Colorado Group shales in northern

Alberta. The results from this investigation indicated that the Second White Specks Formation has elevated values for most elements in comparison with the overlying and underlying shales in northeastern Alberta. For example, the results showed anomalous concentrations of: Au, Pt, Pd, Ag, Sb, As, Cu, Zn, Cd, Co, Ni, V, Mo, Fe, Mn, Ba, Ca, Br, Se, U, Eu, Ce, La, Lu, Nd, Sm, Tb, Y, Yb, S, especially in the northeastern part of the Birch Mountains. The current study is intended to confirm and refine the results obtained for the Birch Mountains core and, if feasible, assess whether the anomalous geochemistry extends into central Alberta. Therefore, the focus of this chapter is on the inorganic geochemistry of the Second White Specks Formation and its potential to contain a Sedex or Ni-Mo type deposit. The following section summarizes various sedimentary metalliferous deposits and compares the results in this study to the various metalliferous deposit types.

### *4.1.1 Summary of: Sedex vs. MVT vs. Ni-Mo Metalliferous Sedimentary Deposits*

#### *4.1.11 Sedex (Sedimentary Exhalative) Deposits*

Sedex deposits are a source of much of the world's zinc and lead production (Lydon, 1996). The definition of a sedimentary exhalative sulphide (Sedex) deposit is given by Lydon (1996) as "*a sulphide deposit formed in a sedimentary basin by the submarine venting of hydrothermal fluids and whose principle ore minerals are sphalerite (ZnS) and galena (PbS)*". There is some difficulty in trying to classify Sedex deposits, because it seems that every deposit is slightly different. For example, various Sedex deposits have different host rocks, which can include one or more of the following; carbonaceous black shales, siltstones, cherty argillites, cherts, sandstones, conglomerates, limestones to dolostones, and even in some areas associated with evaporites, calcareous siltstones or mudstones, or even volcanic rocks (MacIntyre, 1995).

The main economic minerals found in a Sedex deposit are base metal and iron sulphide minerals including sphalerite ($ZnS$), galena ($PbS$), pyrite ($FeS_2$), pyrrhotite ($FeS$), and less commonly, chalcopyrite ($CuFeS_2$), arsenopyrite ($FeAsS$), marcasite

($FeS_2$), and some other sulphide minerals (Large, 1983, Olson et al, 1994). In general, chalcopyrite is usually in small abundances compared to the much larger amounts seen in a volcanogenic massive sulphide (VMS) deposit. Barite ($BaSO_4$) is common in some Sedex deposits, but absent in others. It is reportedly found more often in Proterozoic Sedex deposits according to Lydon (1996). Carbonates, such as siderite ($FeCO_3$), ankerite ($Ca(Mg,Fe)(CO_3)_2$), quartz and tourmaline, exist as gangue minerals (Olson et al, 1994). Antimony, arsenic and bismuth can be present in sulphosalts, such as tetrahedrite, freibergite and boulangerite and they are often found proximal to the vent area (Lydon, 1996). The sulphosalts may also carry silver. Molybdenite, enargite, millerite, freibergite, cobaltite, cassiterite, vallerite and melnikovite have been reported in trace amounts in some deposits (MacIntyre, 1995), but are not very common.

With the above definition and characteristics in mind, a Sedex deposit can be distinguished from some other sedimentary hosted metalliferous deposits as follows. Lydon, (1983) distinguished volcanogenic massive sulphides (VMS) deposits in a few ways. Fore example, he (Ibid) noted that Sedex deposits contain less copper (often as chalcopyrite) in comparison to the lead-zinc in a VMS deposit. VMS deposits have much less lead-zinc relative to Sedex deposits. In general, chalcopyrite is usually economically insignificant in a Sedex deposit (Lydon, 1996). VMS deposits are generally formed at higher temperatures (>300°C) as a result of 'black smokers' in a submarine setting. The average tonnage and total metal content of Sedex deposits tend to be greater than what is observed in most VMS deposits. Sediment hosted deposits often occur singularly, whereas volcanogenic massive sulphide deposits tend to occur in 'bunches' in an ore district. VMS deposits have a volcanic character, whereas Sedex deposits have a sedimentary character (Sangster, 2000). This does not mean that volcanic processes are not be associated with the sedimentary exhalative deposits, but instead the two deposit types primarily have different hosts for the ores.

Sedex deposits vary from Mississippi Valley type (MVT) deposits in that they have more iron and silver, and generally seem to have been emplaced earlier in the sedimentary-diagenetic history (Gustafson et al, 1981). Mississippi Valley type deposits tend to be dominantly or entirely epigenetic. However, there is much debate as to whether Sedex deposits are epigenetic, diagenetic, syngenetic, or all three. Having said this, a syngenetic origin is currently favoured for most Sedex deposits. Lydon (1996) noted that MVT deposits may have a much larger time gap in between the deposition of the host rock and the subsequent timing of mineralization. Sedex deposits, on the other hand appear to have a much earlier timing of mineralization.

Even though not all Sedex deposits are economic, they do provide for interesting study. The variety of Sedex deposits lies in the fact that the geology and the environments of the Earth have been constantly changing throughout its history (Lydon, 1996). The geochemical signature for Sedex deposits is an increase in sulphides, especially Zn, Pb and Fe with or without barite. There is often zoning, with Pb found closest to the vent with increasing Zn outward and upward away from the vent. If barite is present, it is usually found distally from the vent and Cu is often observed within the feeder zone or close to the vent (MacIntyre, 1995).

It is of interest to look at a present day locations that may become a future Sedex deposits. The Black Sea is one such area, where there are deep, sediment starved, anoxic waters where scientists believe that a present day Sedex deposit may develop. This situation appears to be similar to the depositional environment of the Second White Speckled Shale. As discussed in the previous chapter, the Second White Specks Formation was deposited in an overall anoxic environment that was inhospitable to organisms and fairly starved of sediment. This will be further investigated within this chapter, as well as the possibility of the Second White Specks Formation potentially being a host for other metalliferous deposit types.

The Red Dog deposit is an example of a large Mississippian-Pennsylvanian Sedex deposit in Alaska with reported reserves of 150 Mt with average grades of 16.2% Zn, 4.4% Pb and 110 g/t Ag with a vent field of 2400m by 400m deposited within shales (Edgerton, 1997). The ore lies within breccia, transitional and stratiform facies, with the stratiform facies being the periphery of the body and barite rock deposited during the late stage mineralization (Ibid). This deposit will be compared with the Second White Specks Formation later in this chapter.

### *4.1.12 Mississippi Valley-type deposits*

There is some discussion as to the relatedness of the Mississippi Valley-type (MTV) deposits to the Sedex deposits and whether or not they represent a continuum with each being an end member. If MVT and Sedex deposits are the end members of a continuum, then the Irish-type deposits would lie somewhere in between the two. MVT deposits are epigenetic and are hosted in carbonate rocks, as opposed to being hosted in clastic rocks, which is the case for Sedex deposits (Sangster, 1996). Galena (PbS) and sphalerite (ZnS) fill spaces between the carbonate (usually limestone or dolomite) breccia host (Sangster, 1996). Other minerals commonly include pyrite and dolomite, with smaller quantities of marcasite, calcite, quartz, barite, fluorite and chalcopyrite (Olson et al., 1994). Frequently, the ore minerals tend to be coarse grained (Sangster, 1996). The marine platformal carbonates are usually peripheral to undisturbed cratonic sedimentary basins, often below an unconformity or nonconformity (Olson et al., 1994; Sangster, 1996). They occur in tectonically stable areas, unlike those of Sedex deposits.

The age of MVT deposits indicates that they occurred during the Proterozoic to the Cretaceous. In most or all cases, MVT mineralization clearly took place much later in the sediment depositional history whereas Sedex deposits typically are believed to form early in the sediment history; that is, syngenetically or during diagenesis. Finally, in MVT deposits there commonly is associated, and development of high porosity due to a host rock dissolution and brecciation event or dolomitization (Olson et al., 1994). In some cases the breccia may have been formed due to the dissolution of underlying or surrounding beds (Sangster, 1996).

MVT deposits tend to be smaller with sizes on the average of 1 to 10 Mt. MVT grades commonly average between 5 to 10% combined Pb/Zn. Finally, although they are epigenetic MVT deposits tend to be stratabound, and they may occur in groupings of several small to large mineralized bodies (Sangster, 1996). The geochemical signature for these types of deposits includes elevated values for Pb, Zn and Ag.

Deposits of the MVT type in Canada include the Newfoundland Zinc deposit, Polaris deposit, Nanisivik deposit, Gays River deposit, Pine Point deposit and Robb Lake deposit, with Pine Point perhaps being the best known and studied. Further afield, MVT deposits occur in the Tri-State district (USA), East Tennessee district (USA), Old Lead Belt district (USA), Viburnum district (USA) and Bou Beker-El Abed district (Morocco-Algeria) (Sangster, 1996).

### *4.1.13 Shale-hosted Ni-Zn-Mo-PGE*

This type of deposit tends to be sheet-like nickel enriched sulphide layers in marine shales. The commodities include mainly Ni, Mo, with lesser amounts of Zn, Pt, Pd, Au. The sulphide minerals commonly are in thin layers (less than 1 cm to 15 cm thick), comprise pyrite, vaesite ($NiS_2$), jordisite (amorphous $MoS_2$) and sphalerite clusters and zones for tens of kms (Lefebure et al., 1995). Lefebure et al., (1995) also noted that these deposits have usually been found in conjunction with shales deposited within an orogenic belt, but in some places this may occur in shales within stable cratonic settings. They may also be associated with carbonaceous shales and/or phosphorite (Goodfellow et al., 2001).

The two most famous shale-hosted Ni-Mo-Zn-PGE deposits are the middle Devonian Nick deposit in the Yukon and the early Cambrian southern Chinese deposits. However, the Chinese deposits of this type currently are the only ones in the world that have been found to be of economic grade (Hulbert, 1996). Although these metalliferous black shales may not always be of ore grade (aside from the Chinese shales), it has been demonstrated that they are deposited within anoxic waters which are often stagnant bottom waters (Schultz, 1991). This environment of deposition is similar to that of the Second White Specks Formation because the Second White Specks Formation is a dark, organic rich marine shale that was deposited in fairly anoxic conditions. Lefebure and

Coveney (1995) state that the geochemical signature for nickel deposits includes elevated values for Ni, Mo, Au, PGE, C, P, Ba, Zn, Re, Se, As, U, V and S.

### *4.1.2 Metals from Sea Water*

A study of 88 samples from the Atlantic Ocean were analyzed (Brumsack, 1980). They showed that the order of heavy metal enrichment in the shale, relative to average shale in the study, was Pb<Co<Cr<Ni<Cu<V<Zn<Mo<Ag. Therefore, they noticed heavy metal enrichment in the shales where there were no hydrothermal processes, resembled the metal enrichment recorded in normal sea water. Aside from Ag, this conforms to the increasing concentration in normal seawater (Brumsack, 1980). V and Mo are also preferentially concentrated in black shales (Brumsack, 1980). The paper demonstrates that very high concentrations of metals can be produced simply by seawater under the right depositional setting. Thus, the model does not require a source for hydrothermal fluids, restricted basins or fractures, as is normally the case advocated for Sedex, MVT and Irish-type deposits.

### *4.1.3 Other Shales*

A study by Schultz and Coveney (1992) describes Pennsylvanian black shales in the United States which were deposited during almost fully anoxic conditions of sedimentation where the degree of pyritization (DOP) correlates positively with total organic carbon (TOC), with decreasing DOP and TOC suggesting improvement of bottom-water oxygenation and decreased organic matter. The author (Ibid) also discusses papers by Klein (1991) and Hallam (1967) which state that black shales may form at any depth, from deep waters to sea level, and that organic carbon and depth below sea level do not always have a simple relationship for black shales. Recorded values from Schultz and Coveney's 1992 study show variations of elements from over 100 ppm U to much less than 50 ppm U, less than 200 ppm Zn to 3500 ppm Zn and less than 10 ppm Mo to over 500 ppm Mo for the Pennsylvanian black shales.

A study by Lyons and Berner (1992) published an article on deep water coccolith-rich, microlaminated sediments and muds from the black sea where pyrite is forming in the anoxic sulphidic water column and/or near the sediment-water interface with the pyrite formation appearing to vary with regards to the location on the basin slope. The deeper sediments were characterized by 5.3 weight % mean organic carbon with low rates of sulphate reduction (below surficial layers) which demonstrates a low organic matter reactivity even with the basinal anoxia and may be related to accumulation rates. Therefore, black shales can vary widely across geological space and time and must each be treated separately.

## 4.2 Analytical Procedures and Data

### *4.2.1 Lower Detection Limits*

The following tables summarize each analysis and the results for each element that returned a significant number of sample values below the lower detection limit (LDL). The elements that returned more than 25% of values below the lower detection limit include; Ge, Pd, Pt, Ta, Ti and W for Group 1F, Au for Group 1EX and Sn for Group 4B. Please refer to Appendix 6.5 for the complete tables and calculations for accuracy and precision.

**Table 4.1:** Group 1F1 Elements, and summary of number of sample results below LDL

| | Ag (ppb) | Al (%) | As (ppm) | Au (ppb) | B (ppm) | Ba (ppm) | Be (ppm) | Bi (ppm) | Ca (%) |
|---|---|---|---|---|---|---|---|---|---|
| **LDL** | 2 | 0.01 | 0.1 | 0.2 | 1 | 0.5 | 0.1 | 0.02 | 0.01 |
| **Number of Samples** | 540 | 540 | 540 | 540 | 540 | 540 | 68 | 540 | 540 |
| **Values < LDL** | 0 | 0 | 0 | 95 | 1 | 0 | 0 | 1 | 0 |
| **Percentage < LDL** | 0 | 0 | 0 | 17.6 | 0.2 | 0 | 0 | 0.2 | 0 |

| | Cd (ppm) | Ce (ppm) | Co (ppm) | Cr (ppm) | Cs (ppm) | Cu (ppm) | Fe (%) | Ga (ppm) | Ge (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.01 | 0.1 | 0.1 | 0.5 | 0.02 | 0.01 | 0.01 | 0.1 | 0.1 |
| **Number of Samples** | 540 | 68 | 540 | 540 | 68 | 540 | 540 | 540 | 68 |
| **Values < LDL** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 56 |
| **Percentage < LDL** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 82.4 |

| | Hf (ppm) | Hg (ppb) | In (ppm) | K (%) | La (ppm) | Li (ppm) | Mg (%) | Mn (ppm) | Mo (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.02 | 5 | 0.02 | 0.01 | 0.5 | 0.1 | 0.01 | 1 | 0.01 |
| **Number of Samples** | 68 | 540 | 68 | 540 | 540 | 68 | 540 | 540 | 540 |
| **Values < LDL** | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| **Percentage < LDL** | 2.9 | 0 | 0 | 0 | 0.2 | 0 | 0 | 0 | 0 |

| | Na (%) | Nb (ppm) | Ni (ppm) | P (%) | Pb (ppm) | Pd (ppb) | Pt (ppb) | Rb (ppm) | Re (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.001 | 0.02 | 0.1 | 0.001 | 0.01 | 10 | 2 | 0.1 | 1 |
| **Number of Samples** | 540 | 68 | 540 | 540 | 540 | 68 | 68 | 68 | 68 |
| **Values < LDL** | 0 | 0 | 0 | 0 | 0 | 62 | 48 | 0 | 4 |
| **Percentage < LDL** | 0 | 0 | 0 | 0 | 0 | 92.2 | 70.6 | 0 | 5.9 |

| | S (%) | Sb (ppm) | Sc (ppm) | Se (ppm) | Sn (ppm) | Sr (ppm) | Ta (ppm) | Te (ppm) | Th (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.02 | 0.03 | 0.1 | 0.1 | 0.1 | 0.5 | 0.05 | 0.02 | 0.1 |
| **Number of Samples** | 540 | 540 | 540 | 540 | 68 | 540 | 68 | 540 | 540 |
| **Values < LDL** | 1 | 0 | 0 | 0 | 0 | 0 | 68 | 14 | 0 |
| **Percentage < LDL** | 0.2 | 0 | 0 | 0 | 0 | 0 | 100 | 2.6 | 0 |

| | Ti (%) | Tl (ppm) | U (ppm) | V (ppm) | W (ppm) | Y (ppm) | Zn (ppm) | Zr (ppm) |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.001 | 0.02 | 0.1 | 2 | 0.1 | 0.01 | 0.1 | 0.1 |
| **Number of Samples** | 540 | 540 | 540 | 540 | 540 | 68 | 540 | 68 |
| **Values < LDL** | 208 | 0 | 0 | 0 | 533 | 0 | 0 | 0 |
| **Percentage < LDL** | 38.5 | 0 | 0 | 0 | 98.7 | 0 | 0 | 0 |

**Table 4.2:** Group 1EX Elements, and summary of number of sample results below LDL

| | Ag (ppm) | Al (%) | As (ppm) | Au (ppm) | Ba (ppm) | Be (ppm) | Bi (ppm) | Ca (%) | Cd (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.1 | 0.01 | 1 | 0.1 | 1 | 1 | 0.1 | 0.01 | 0.1 |
| **Number of Samples** | 0 | 0 | 0 | 84 | 0 | 1 | 0 | 0 | 0 |
| **Values < LDL** | 0 | 0 | 0 | 84 | 0 | 1 | 0 | 0 | 0 |
| **Percentage < LDL** | 0 | 0 | 0 | 100 | 0 | 1.2 | 0 | 0 | 0 |

| | Ce (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (%) | Hf (ppm) | K (%) | La (ppm) | Li (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| **LDL** | 1 | 1 | 0.1 | 0.1 | 0.01 | 0.1 | 0.01 | 0.1 | 0.1 |
| **Number of Samples** | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 |
| **Values < LDL** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Percentage < LDL** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

|  | Mg (%) | Mn (ppm) | Mo (ppm) | Na (ppm) | Nb (ppm) | Ni (ppm) | P (%) | Pb (ppm) | Rb (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.01 | 1 | 0.1 | 0.001 | 0.1 | 0.1 | 0.001 | 0.1 | 0.1 |
| **Number of Samples** | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 |
| **Values < LDL** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Percentage < LDL** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

|  | S (%) | Sb (ppm) | Sc (ppm) | Sn (ppm) | Sr (ppm) | Ta (ppm) | Th (ppm) | Ti (%) | U (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.1 | 0.1 | 1 | 0.1 | 1 | 0.1 | 0.1 | 0.001 | 0.1 |
| **Number of Samples** | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 |
| **Values < LDL** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Percentage < LDL** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

|  | V (ppm) | W (ppm) | Y (ppm) | Zn (ppm) | Zr (ppm) |
|---|---|---|---|---|---|
| **LDL** | 1 | 0.1 | 0.1 | 1 | 0.1 |
| **Number of Samples** | 84 | 84 | 84 | 84 | 84 |
| **Values < LDL** | 0 | 0 | 0 | 0 | 0 |
| **Percentage < LDL** | 0 | 0 | 0 | 0 | 0 |

**Table 4.3:** Group 4B - REE Elements, and summary of number of sample results below LDL

|  | Ce (ppm) | Co (ppm) | Cs (ppm) | Dy (ppm) | Er (ppm) | Eu (ppm) | Ga (ppm) | Gd (ppm) | Hf (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.5 | 0.5 | 0.1 | 0.05 | 0.05 | 0.05 | 0.5 | 0.05 | 0.5 |
| **Number of Samples** | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 |
| **Values < LDL** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Percentage < LDL** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

|  | Ho (ppm) | La (ppm) | Lu (ppm) | Nb (ppm) | Nd (ppm) | Pr (ppm) | Sn (ppm) | Rb (ppm) | Sm (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.05 | 0.5 | 0.01 | 0.5 | 0.4 | 0.02 | 1 | 0.5 | 0.1 |
| **Number of Samples** | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 |
| **Values < LDL** | 0 | 0 | 0 | 0 | 0 | 0 | 42 | 0 | 0 |
| **Percentage < LDL** | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 0 | 0 |

|  | Sr (ppm) | Ta (ppm) | Tb (ppm) | Th (ppm) | Tm (ppm) | U (ppm) | V (ppm) | W (ppm) | Y (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.5 | 0.1 | 0.01 | 0.1 | 0.05 | 0.1 | 5 | 0.1 | 0.1 |
| **Number of Samples** | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 |
| **Values < LDL** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Percentage < LDL** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

|  | Yb (ppm) | Zr (ppm) |
|---|---|---|
| **LDL** | 0.05 | 0.5 |
| **Number of Samples** | 84 | 84 |
| **Values < LDL** | 0 | 0 |
| **Percentage < LDL** | 0 | 0 |

**Table 4.4:** Group 4A Elements, and summary of number of sample results below LDL

|  | Al2O3 (%) | Ba (ppm) | CaO (%) | Cr2O3 (%) | Fe2O3 (%) | K2O (%) | LOI (%) | MgO (%) | MnO (%) |
|---|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.03 | 5 | 0.01 | 0.001 | 0.04 | 0.04 | 0.1 | 0.01 | 0.01 |
| **Number of Samples** | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 |
| **Values < LDL** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Percentage < LDL** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

|  | Na2O (%) | Ni (ppm) | P2O5 (%) | Sc (ppm) | SiO2 (%) | TiO2 (%) | TOT/C (%) | TOT/S (%) |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.01 | 30 | 0.01 | 1 | 0.02 | 0.01 | 0.01 | 0.01 |
| **Number of Samples** | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 |
| **Values < LDL** | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Percentage < LDL** | 0 | 9.5 | 0 | 0 | 0 | 0 | 0 | 0 |

### *4.2.2 Precision*

Ziegler and Combs (1997) give the percentage recovery for each standard measurement, which is a measure of accuracy, by the following equation (G. Prior, personal communication, 2004):

Percentage recovery = 100 x $C_M/C_A$ where
$C_M$ = the measured concentration of the standard sample
$C_A$ = the actual concentration of the standard sample (recommended or provisional value)

For the data sets which have a sufficient quantity of replicate determinations for a given standard sample, the relative standard deviation (RSD) can be calculated which provides a measure of precision. The following equation is applied:

RSD = s/x

where

RSD = relative standard deviation

s = standard deviation

x = mean of replicate determinations

The following tables contain the results for the precision calculations for each element. Please refer to Appendix 6.5 for the full calculations.

**Table 4.5:** Relative standard deviation results for GROUP 1F1 elements

| Laboratory standards RSD values | Elements |
|---|---|
| **</= 5%** | Al, Ba, Fe, Ga, K, La, Mg, Mn, Na, Sr, Ti, Tl, Zn |
| **>5% and </=10%** | Ca, Co, Cr, Cu, Ni, P, Pb, V |
| **>10% and </=20%** | Cd, Mo, Sc, Th, U |
| **>20% and </=50%** | Ag, B |
| **>50% and </=100%** | Se |
| **>100% and </=150%** | |
| **N/A (over 25% samples <LDL)** | As, Au, Bi, Hg, S, Sb, Te, W |

**Table 4.6:** Relative standard deviation results for GROUP 1F1 elements part 2

| Laboratory standards RSD values | Elements |
|---|---|
| **</= 5%** | Al, Ba, Ca, Co, Cs, Cu, Fe, Ga, K, La, Li, Mg, Mn, Na, P, Rb, Sr, Ti, Tl, Y, Zn |
| **>5% and </=10%** | Ce, Cr, Nb, Ni, Pb, Sc, Sn, U, V, Zr |
| **>10% and </=20%** | B, Cd, Mo, Th |
| **>20% and </=50%** | Ag, Be, Hf, In, Se |
| **>50% and </=100%** | |
| **>100% and </=150%** | |
| **N/A (over 25% samples <LDL)** | As, Au, Bi, Ge, Hg, Pd, Pt, Re, S, Sb, Ta, Te, W |

**Table 4.7:** Relative standard deviation results for GROUP 1EX elements

| Laboratory standards RSD values | Elements |
|---|---|
| **</= 5%** | Al, Fe, K, Mn, Zn |
| **>5% and </=10%** | Ca, Li, Mg, Na, Nb, P, Pb, Sr, Ti |
| **>10% and </=20%** | Ba, Cr, Cu, Hf, Ni, Sn, Ta, Y, Zr |
| **>20% and </=50%** | As, Be, Cd, Ce, La, Mo, Rb, Th, U, V |
| **>50% and </=100%** | Co |
| **>100% and </=150%** | |
| **N/A (over 25% samples <LDL)** | Ag, Au, Bi, S, Sb, Sc, W |

**Table 4.8:** Relative standard deviation results for GROUP 4B - REE

| Laboratory standards RSD values | Elements |
|---|---|
| **</= 5%** | Ce, Dy, Er, Ga, Gd, La, Lu, Nb, Nd, Pr, Rb, Sm, Sr, Ta, Y, Yb, Zr |
| **>5% and </=10%** | Co, Cs, Eu, Hf, Ho, Tb, Tm |
| **>10% and </=20%** | |
| **>20% and </=50%** | Sn, Th, U |
| **>50% and </=100%** | |
| **>100% and </=150%** | W |
| **N/A (over 25% samples <LDL)** | V |

**Table 4.9:** Relative standard deviation results for GROUP 4A

| Laboratory standards RSD values | Elements |
|---|---|
| **</= 5%** | Al2O3, Ba, CaO, Fe2O3, K2O, MgO, MnO, Na2O, SiO2, TiO2, TOT/C |
| **>5% and </=10%** | LOI, P2O5 |
| **>10% and </=20%** | |
| **>20% and </=50%** | Sc |
| **>50% and </=100%** | |
| **>100% and </=150%** | |
| **N/A (over 25% samples <LDL)** | Cr2O3, Ni, TOT/S |

**Table 4.10:** Relative standard deviation results for CO2

| Laboratory standards RSD values | Elements |
|---|---|
| **</= 5%** | CO2 |
| **>5% and </=10%** | |
| **>10% and </=20%** | |
| **>20% and </=50%** | |
| **>50% and </=100%** | |
| **>100% and </=150%** | |
| **N/A (over 25% samples <LDL)** | C/ORG, C/GRA, SO4 |

### *4.2.3 Duplicate Pairs*

The relative percentage difference (RPD) represents a measure of precision and is calculated with the following equation (Ziegler and Combs, 1997, Zimmerman et al., 2001, G. Prior, personal communication, 2004):

$RPD = 100 \times |C_1 - C_2| / C_x$

where

RPD = relative percentage difference

$|C_1 - C_2|$ = absolute value of the difference between the two duplicate pair concentrations

$C_x$ = mean of the two results

The following tables summarize the calculations for the duplicate pairs (precision calculations).

**Table 4.11:** Relative percentage difference for GROUP 1F1 elements

| Laboratory duplicate pair Average RPD values | Elements |
|---|---|
| **</= 5%** | Cu, Fe, Mg, Ni, Sr |
| **>5% and </=10%** | Ag, Al, As, Bi, Ca, Cd, Co, Cr, Ga, K, La, Mn, Mo, Na, P, Pb, Sb, Se,Th, U, V, Zn |
| **>10% and </=20%** | B, Ba, Hg, S, Tl |
| **>20% and </=50%** | Te |
| **>50% and </=100%** | Au |
| **>100% and </=150%** | |
| **N/A (over 25% samples <LDL)** | Ti, W |

**Table 4.12:** Relative percentage difference for GROUP 1F1 elements

| Laboratory duplicate pair Average RPD values | Elements |
|---|---|
| **</= 5%** | |
| **>5% and </=10%** | Ag, As, B, Bi, Cu, Fe, Hg, La, Mo, Na, Sn, Sr, Th |
| **>10% and </=20%** | Al, Ba, Ca, Cd, Ce, Co, Cs, Ga, In, Li, Mg, Mn, Ni, P, Pb, Rb, S, Sb, Sc, Se, Te, Tl, U, Y, Zn, Zr |
| **>20% and </=50%** | Be, Cr, Hf, K, Nb, Re, V |
| **>50% and </=100%** | Au |
| **>100% and </=150%** | |
| **N/A (over 25% samples <LDL)** | Ge, Pd, Pt, Ta, Ti, W |

**Table 4.13:** Relative percentage difference for GROUP 1EX elements

| Laboratory duplicate pair Average RPD values | Elements |
|---|---|
| **</= 5%** | S, Ta |
| **>5% and </=10%** | Al, Ce, Fe, Hf, Li, Mg, Na, Nb, Pb, Sc, Sr, Th, Ti, V, Zr |
| **>10% and </=20%** | Ag, As, Ca, Co, Cr, Cu, K, La, Mn, Mo, Ni, P, Sb, Sn, U, W, Y, Zn |
| **>20% and </=50%** | Ba, Be, Bi, Cd, Rb |
| **>50% and </=100%** | |
| **>100% and </=150%** | |
| **N/A (over 25% samples <LDL)** | Au |

**Table 4.14:** Relative percentage difference for GROUP 4B - REE

| Laboratory duplicate pair Average RPD values | Elements |
|---|---|
| **</= 5%** | Ce, Ga, La, Pr, Zr |
| **>5% and </=10%** | Gd, Hf, Lu, Nb, Nd, Rb, Sm, Sr, Ta, Tm, V, Y, Yb |
| **>10% and </=20%** | Co, Cs, Dy, Er, Eu, Ho, Tb, Th, U |
| **>20% and </=50%** | W |
| **>50% and </=100%** | |
| **>100% and </=150%** | |
| **N/A (over 25% samples <LDL)** | Sn |

**Table 4.15:** Relative percentage difference for GROUP 4A

| Laboratory duplicate pair Average RPD values | Elements |
|---|---|
| **</= 5%** | Al2O3, LOI, SiO2, TiO2 |
| **>5% and </=10%** | Ba, Cr2O3, Fe2O3, K2O, MgO, Na2O, Sc, TOT/S |
| **>10% and </=20%** | CaO, Cr2O3, MnO, P2O5, TOT/C, C/ORG, SO4 |
| **>20% and </=50%** | Ni, CO2 |
| **>50% and </=100%** | |
| **>100% and </=150%** | |
| **N/A (over 25% samples <LDL)** | C/Gra |

Overall, the accuracy and precision calculations seem reasonable for the elements that have enough information above their lower detection limits.

### 4.3 Elemental Values with Depth

Values for Zn, S, Ni, Mo, Fe, Cu, Ag and C-org (if available) are plotted against depth for every core in Appendix 6.6. It must be noted, however, that not every core has been confirmed to include the Second White Specks Formation, so general conclusions can not be made on the geochemistry of all the cores and these generalizations for core not of Second White Specks origin are also included in Appendix 6.6. Therefore, the cores that have the most information will be concentrated on in this section and brief comments about the other core are included, with their graphs of elemental values versus depth included in Appendix 6.6. 7BK03 represents the core from northeastern Alberta, 10-22-047-03W4 represents core from east central Alberta and 06-31-046-08W5 is plotted to represent a partial core from the deep basin.

### 7BK03 (Birch Mountains Core):

The core placement was determined based on the combination of palynology and lithology. The core interval ranges from 72.17 m to 102.05 m depth and the Second White Specks interval represents 74.875 m to 100.94 m depth. Therefore, the core represents the Second White Specks Formation and the overlying and underlying shales.

Values observed for the core in the Birch Mountains show a bimodal distribution, with a smaller peak near the base of the Second White Specks Formation, and a much larger peak near the top of the Formation. Values for the elements are much lower in the underlying Belle Fourche Formation and the overlying Labiche Shales. The peak values for most elements occur at the same depth of around 80 m. This would indicate that for this core, the upper Second White Specks Formation is more metalliferous than the base. Organic carbon shows this general trend strongly with Ag, Ni, Zn, Mo and Cu. Fe and S show a general trend of higher values near the base and top of the formation, but are not as prominent as the other elements mentioned (Figure 4.1).

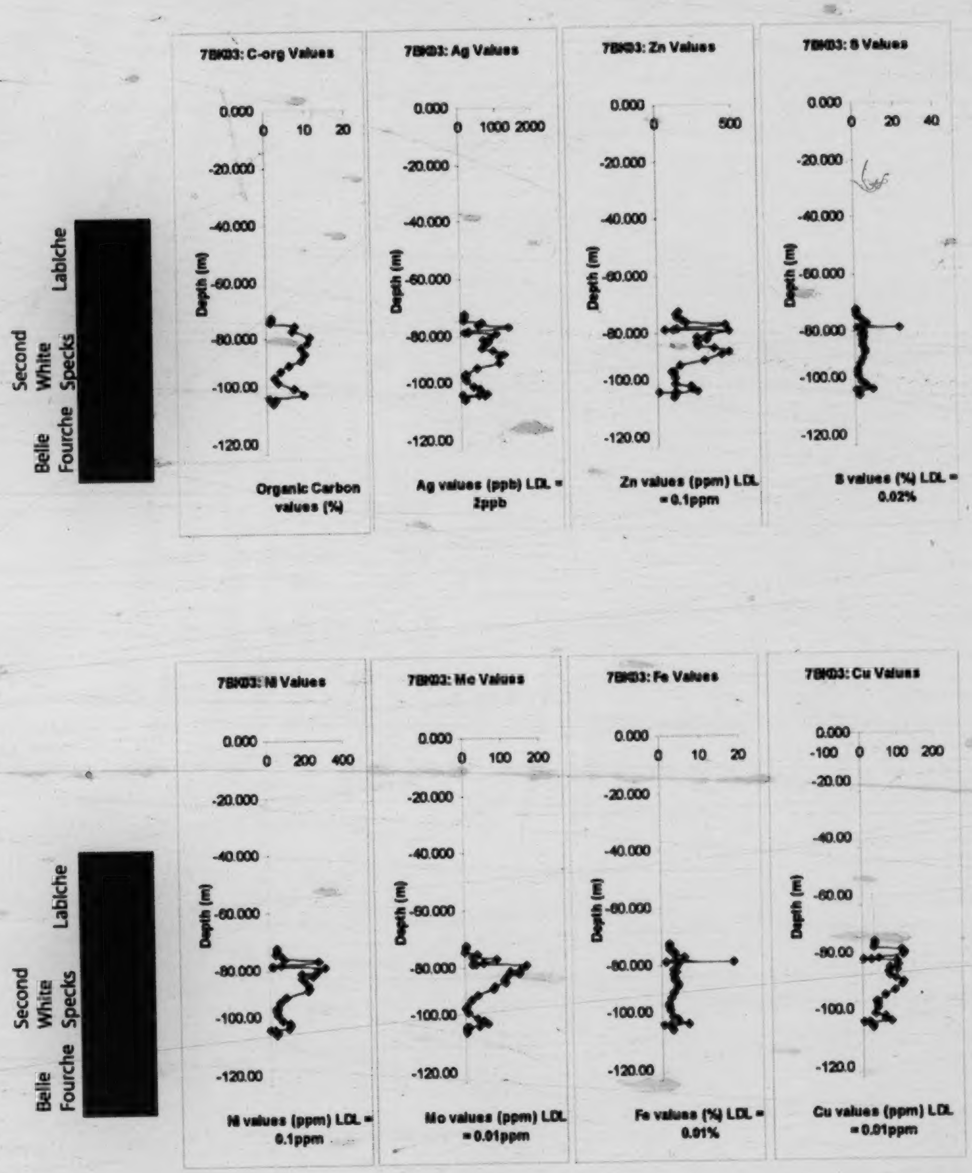

**Figure 4.1:** Values for various metals and elements with depth for the core 7BK03.

7BK03 (Birch Mountains Core – Tintina Report (Sabag, 1998)): Second White Specks Formation depth from 75.03 m to 101.23 m

The following plots were constructed from information from the Tintina assessment reports (Sabag, 1996; Sabag 1998). The geochemistry in the report was much more extensive than this study; nonetheless the results for the Second White Specks Formation were very close to those in the Tintina report.

These plots reinforce the bimodal concentration of elements within the Second White Specks Formation in northeastern Alberta. The top of the Second White Specks is much more metalliferous than the base. The plots also show a nice comparison between the much more metal rich Second White Specks Formation and the overlying and underlying shales which have much lower concentrations of metals. Another observation is the fact that the organic carbon content is greatly reduced in the overlying and underlying shales. The rest of the plotted elements tend to follow this general pattern (Figure 4.2).

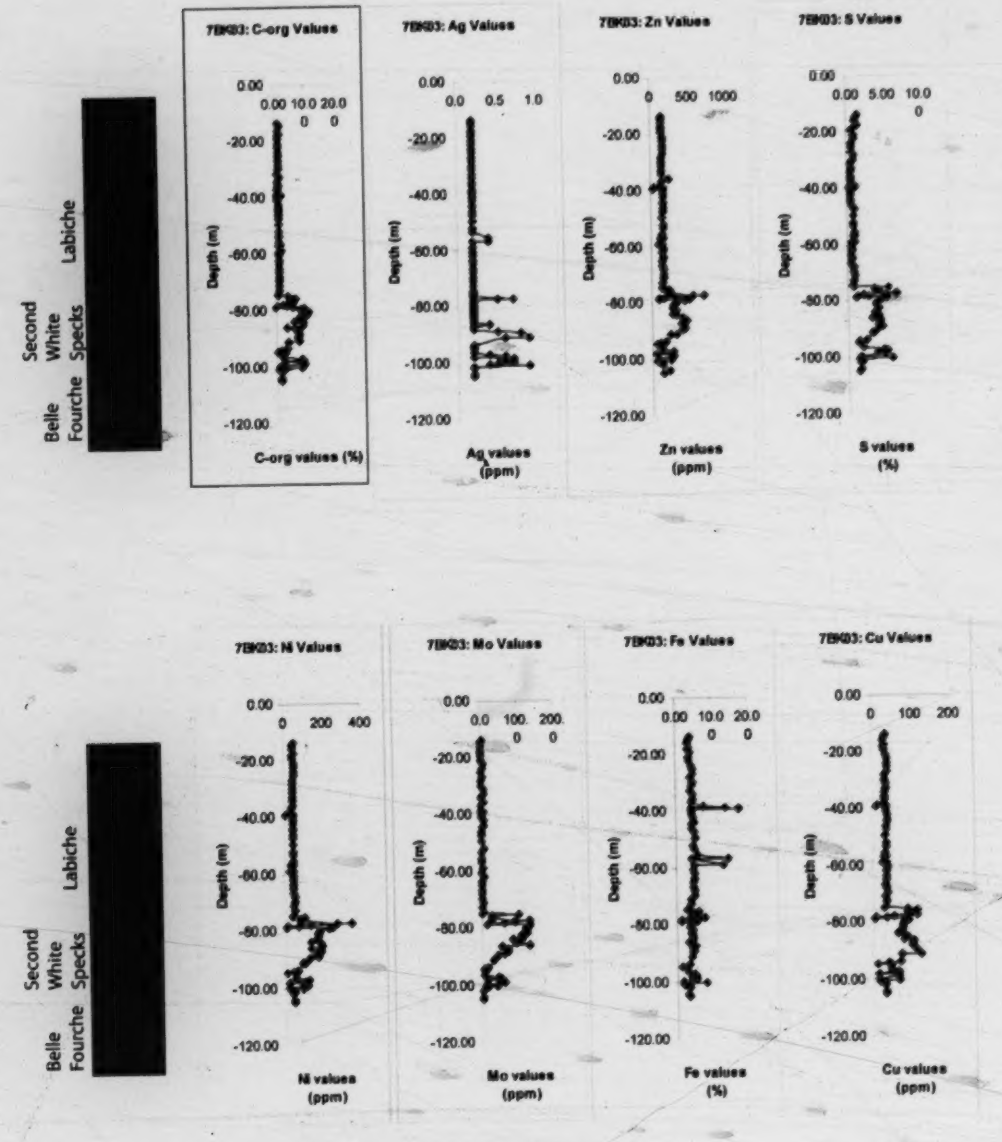

**Figure 4.2:** Values for various metals and elements with depth for the core 7BK03.

10-22-047-03W4:

The core placement was determined based on precise dating using micropaleontology. The exact depth of the Second White Specks Formation is known. The cored interval ranges from 409.02 m to 463.27 m depth and the Second White Specks Formation interval ranges from 426 m to 440 m. Therefore, the core represents the whole Second White Specks Formation interval and the overlying Carlile Formation shales and the underlying Belle Fourche Formation shales.

A general increase in organic carbon is seen within the Second White Specks Formation, but unlike the core from 7BK03, the metals do not all follow the same trend. There appears to be a bimodal distribution in the elements, but the highest values are observed near the base of the core, with the lowest values near the center of the core, and slightly more elevated values near the top of the formation. Molybdenum shows the greatest correlation with the organic carbon content. Most of the other metals, aside from Fe, are slightly concentrated within the Formation. The most likely explanation of the increased concentration of both S and Fe in the underlying Belle Fourche Formation is the increased amount of pyrite observed within the core (Figure 4.3).

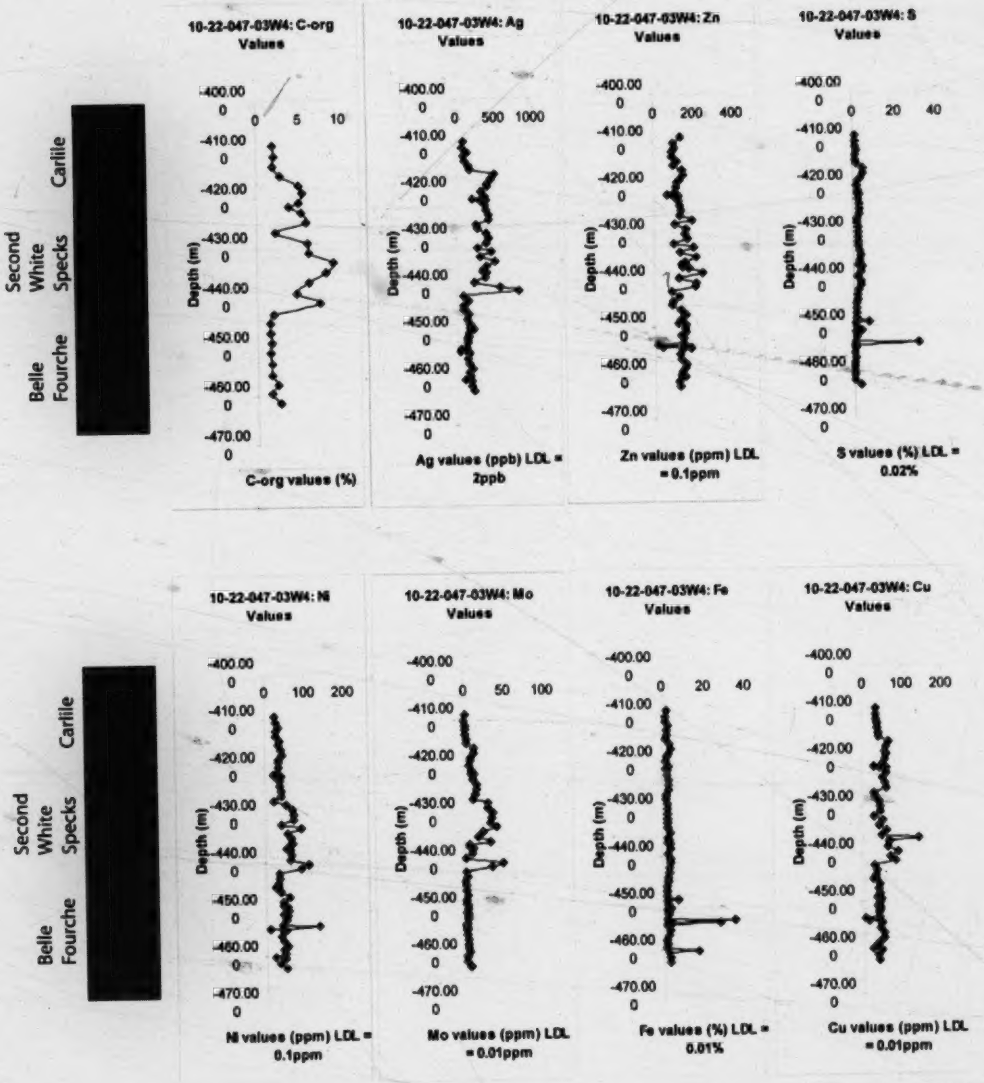

**Figure 4.3:** Values for various metals and elements with depth for the core 10-22-047-03W4.

06-31-046-08W5:

The core placement was determined based on geophysical log signatures, palynology and lithology. The core ranges from 1803 m to 1822.49 m and the Second White Specks Formation ranges from 1782 m to 1904 m depth. Therefore, the core represents the top portion of the Second White Specks Formation. Mo decreases slightly up section. Ag, Cu, Fe, Ni, S and Zn show similar geochemical signatures, only varying within a small window of values. The geochemical signature does not correspond to anything specifically observed within the core. The core is a homogeneous dark grey shale with minor amounts of pyrite and calcite nodules at the base.

Of the plots, this one represents core that is from the deeper basin within Alberta. It has the lowest concentration of organic carbon content. This may be due to the core being closer to the area of maturation for the Second White Specks Formation, and consequently, hydrocarbons were lost from the shale, showing a much lower organic carbon content than what was originally in place (a discussion of this is in the following sections). This might also explain why the other plots of metals and elements do not follow the general trend of the present organic carbon content. The organic carbon response is fairly flat, decreasing slightly up hole towards the Carlile Formation (Figure 4.4).

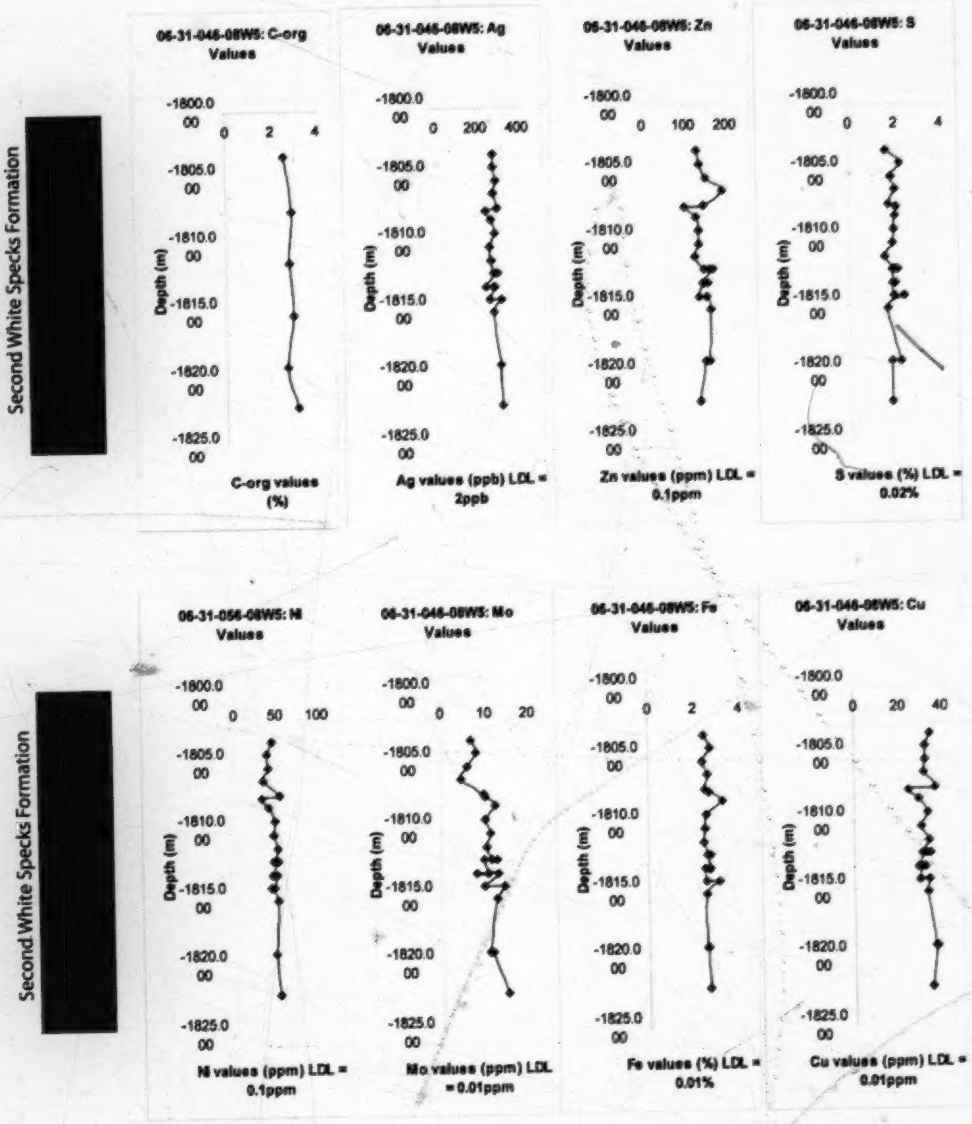

**Figure 4.4:** Values for various metals and elements with depth for the core 06-31-046-08W5.

Refer to Appendix 6.6 for the plots of elements versus depth for each core.

### 00/05-10-051-04W5/0

The core placement was determined based on the combination of geophysical log signatures and confirmation by palynology. The core ranges from 1252.36 m to1305.675 m and the Second White Specks Formation interval was determined to be from 1202 m to 1289 m depth. Therefore, the top of the underlying Belle Fourche is represented by 1289 m to 1305 m depth and the base of the Second White Specks Formation is represented by 1252 m to 1289 m depth. The organic carbon response is much higher (ranging from 3 to 5 %) within the Second White Specks Formation than the 2 to 3 % for the underlying Belle Fourche Formation. Ag, Cu, Ni, S, Zn follow the same general signature as organic carbon where the values are variable in the underlying Belle Fourche, but are generally slightly higher within the Second White Specks Formation. The low values at the base of the core represent fractured locations within the formation where carbonate has infilled the voids. The rest of the core remains a homogeneous dark grey shale with minor sandy laminations and pyrite. The higher values observed at approximately 1259 m do not correlate with anything directly observed in the core. The Fe signature remains fairly constant throughout the core with small lows and highs. The Mo signature is slightly different, with the maximum values being in the middle of the core at the base of the Second White Specks Formation. The Mo values increase up to the base of the Second White Specks Formation, and then decreases upwards.

### 00/06-11-061-22W4/0

The core placement was determined based on the combination of geophysical log signatures, micropaleontology and lithology. The core ranges from 499.85 m to 513.52 m and the Second White Specks interval ranges from 506 m to 553 m. Therefore, the core represents the top of the Second White Specks Formation from 506 m to 513.52 m depth and the basal Carlile from 499.85 m to 506 m depth. All of the plotted elements tend to follow the same geochemical pattern, aside from the last top two samples from the Carlile Formation. The top two samples increase upwards for Ag, Fe, Mo, S and Zn and decrease upwards for Cu and Ni. The signature has two low points within the top of the Second

White Specks Formation and generally increases slightly within the Carlile Formation. The low results within the Second White Specks correspond to sands observed within the core. The higher values correspond to the dark grey shales. The higher values within the Carlile Formation correspond to a higher concentration of pyrite observed within the core.

### 00/06-26-059-20W4/0

The core placement was determined based on a combination of geophysical log signatures, micropaleontology and lithology. The core ranges from 458.09 m to 471.05 m and the Second White Specks Formation ranges from 447 m to 486 m. Therefore the core represents the centre of the Second White Specks Formation. The Mo values within this hole are quite distinct in that the values increase to the top of the core. There are multiple bentonites within this core, and concentrations of pyrite in lenses and nodules which most likely correlates with the variation in response of Fe and S which have similar geochemical signatures. Ag, Cu, Ni and Zn increase in value up the core to approximately 464 m depth, drastically decreasing at 464 m and then increase up to the top of the core. There are no clear correlations with the physical core and the variations in geochemical signature, aside from a slight visible increase in concentration of pyrite and organic matter up hole above 464 m depth.

### 00/06-35-059-21W4/0

The core placement was determined based on geophysical log signature and lithology. The core ranges from 457.18 m to 469.37 m depth and the Second White Specks Formation ranges from 463 m to 504 m depth. Therefore, the core represents the top 6 m (463 m to 469 m) of the Second White Specks Formation and the bottom 6m of the overlying Carlile Formation. The geochemical signature is fairly distinct with a general increase in metal values to 465 m depth where there is a low point, and a general decrease in all the metals up the core within the Carlile Formation. Ag, Cu, Fe, Mo, Ni, S and Zn all have the lowest values at approximately 465 m in depth, which corresponds to a sandier package within the shale. The values of the metals tend to increase within the Second White Specks Formation toward the sandier interval, then decreasing values are observed within the Carlile Formation.

00/09-09-056-19W5/0

The core placement was determined based on geophysical log signature, micropaleontology and lithology. The core ranges from 2237.12 m to 2273.09 m and the Second White Specks Formation interval ranges from 2198 m to 2282 m. Therefore the core represents the center and base of the Second White Specks Formation. Generally, the plotted elements Ag, Cu, Mo and Ni demonstrate a bi-modal distribution with higher values near the base and top of the core, with the lowest values between 2255.5 m and 2265 m depth. There is no correlation between these lower values or anything observed within the core, aside from the fact pyrite and organic matter are more concentrated below 2254 m and above 2265 m. Zn, S and Fe demonstrate fairly consistent values with small variations.

00/10-28-059-20W5/0

The core placement was based on geophysical log signatures, micropaleontology and lithology. The core ranges from 1876.56 m to 1888.5 m depth and the Second White Specks Formation interval ranges from 1787 m to 1906 m. Therefore, the core represents the base of the Second White Specks Formation. Ag, Cu, Fe, Ni, S and Zn have variable responses that peak at approximately 1880 m depth and tend to decrease to the top of the core. Within the logged core, this corresponds to a general increase in the abundance of sand and reaction with hydrochloric acid. Pyrite is also present more often up the section of core. Molybdenum's response increases up the core to 1882 m, then decreases to 1880 m, then increases to its maximum at 1878 m and then decreasing in value up the core. This pattern is not reflected by any physical characteristic observed within the core.

### 00/10-36-060-22W4/0

The core placement was based on geophysical logs and micropaleontology. The core ranges from 489.79 m to 498.59 m depth and the Second White Specks Formation interval ranges from 491 m to 535 m depth. Therefore, the core represents the top of the Second White Specks Formation from 491 m to 498.59 m and the base of the overlying Carlile Formation from 489.79 to 491 m depth. All of the elemental values plotted follow the same trend, remaining constant at the base of the core, decreasing to minimum values between 494 m to 496 m and then increasing back to the initial values observed at the base of the core. The low values correspond to a sand package observed 493 and 496.5 m depth with an increase in abundance of sand above this interval. The remaining shales at the base of the core (Second White Specks) and the shales from the overlying Carlile Formation have similar values for Ag, Cu, Fe, Mo, Ni, S and Zn.

### 00/14-29-048-06W5/0

The core placement was based on geophysical logs, palynology and lithology. The core interval ranges from 1539.16 m to 1577.32 m and the Second White Specks Formation ranges from 1532 m to 1595 m depth. Therefore, the interval represents the top and center of the Second White Specks Formation. The Zn, Mo and Fe values correspond well, with consistent lower values throughout the core with a high value at approximately 1567 m depth. The physical feature at this point is a lense of pyrite. Values for Ag, Cu, Ni and Zn remain fairly constant, with a slight high at 1567 m. Organic carbon increases to 1567 m and gradually decreases up the core.

### 00/16-12-046-03W5/0

The core placement was based on geophysical log signatures and micropaleontology. The core ranges from 1533.07 m to 1574.99 m depth and the Second White Specks Formation interval ranges from 1474 m to 1552 m depth. Therefore, the core covers the base of the Second White Specks Formation (from 1533.07 m to 1552.07

m depth) and the top of the underlying Belle Fourche Formation from 1552.07 m to 1574.99 m depth. There are not enough samples for the organic carbon to make any concise observations, but the trend appears to decrease up the core. The values of Ag, Zn and Cu are higher within the underlying Belle Fourche Formation and decrease upwards into the Second White Specks Formation. The values for Mo, S and Ni are higher within the Second White Specks as opposed to the underlying Belle Fourche Formation, and Fe remains fairly constant throughout the two formations. It is hard to make generalizations for this core because there was abundant lost core throughout the cored interval.

02/06-30-064-01W6/0

The core placement was determined based on geophysical log signatures and lithology. The core interval ranges from 1555 m to 1563.6 m depth , and the range of the Second White Specks Formation ranges from 1515 m to an unknown depth. The core does, however, appear to contain the basal section of the Second White Specks Formation. Cu, Ni, S, Zn, Ag and Fe have similar patterns where the values remain fairly constant, aside from a low value at approximately 1559 m depth. This corresponds to a sample that was slightly sandier than other samples sent, and the rest of the core is a homogeneous dark grey shale with minor silt and sand. The Mo value decreases up the section of core and does not follow the pattern of the other elements.

02/07-33-052-15W5/0

The core placement was determined using geophysical log signatures, micropaleontology and lithology. The interval range for the core is from 1950 m to 1969.18 m and the Second White Specks Formation interval ranges from 1880 m to 1955 m depth. Therefore, the core represents the base (1950 m to 1955 m) of the Second White Specks Formation and the top (1955 m to 1969.18 m) of the Belle Fourche Formation. Generally, the values of Ag, organic carbon, Cu, Mo and Ni increase upward into the Second White Specks Formation with a minimum value at the contact between the two formations that can not be explained by a physical feature observed in the core. Fe, Zn and S remain fairly constant throughout the formations, with the peaks in the Fe values corresponding to Fe staining observed within the core, and the low value corresponding to the contact between the Second White Specks Formation and the Belle Fourche Formation.

02/16-18-064-02W6/0

The core placement was determined using geophysical log signatures. The interval for the core ranges from 1696 m to 1706.1 m and the interval for the Second White Specks Formation ranges from 1659 m to 1717 m. Therefore, the interval of the core represents the base of the Second White Specks Formation. Ag, Mo and S tend to decrease slightly up the cored section. Cu and Ni have similar signatures and tend to increase slightly up section. Iron and Zn have values that remain fairly constant throughout the core. These value shifts do not appear to correspond to any physical changes observed within the core.

02/16-27-058-20W5/0

The core placement was determined based on geophysical log signatures, micropaleontology and lithology. The cored interval ranges from 1825.05 m to 1836.8 m depth and the Second White Specks Formation ranges from 1772 m to 1856 m depth. Therefore, the core represents the middle to base of the Second White Specks Formation interval. All elements that were plotted tend to follow a similar geochemical pattern aside from Mo. Molybdenum values increase up the cored section. The values for Ag, Cu, Fe, Ni and S remain constant up the core aside from a peak at approximately 1828 m depth and gradually return up section to the values observed at the base of the core. The values may have increased in the interval due to the presence of pyritized shells. The value of Zn fluctuates slightly throughout the interval of core.

7AS01 (00/06-12-098-13W4)

The core placement was determined based on micropaleontology and lithology. The cored interval ranges from 11.27 m to 19.48 m depth and the Second White Specks interval ranges from 11.27 m to 18.48 m. Therefore, the core represents the Second White Specks Formation and the top of the underlying shale. The values of Ag and Cu decrease up the core and increases just at the top of the core. Ni, Mo and Zn all increase in value up the core. S and Fe decrease in value up the core and just at the top of the core, the values increase slightly. The only change in the core is the increase in organic matter up section.

### *4.3.1 Discussion*

The two cores that contain the top and basal contacts for the Second White Specks Formation show an increase for most of the plotted elements (organic carbon, Ag, Zn, Ni, Mo, Cu) within the Second White Specks and a lower response within the underlying and overlying shales. Both these cores are in eastern Alberta, which was closest to the paleoshoreline to the east during the deposition of the Second White Specks Formation. Both have a geochemical response that is higher near the base of the formation, decreases and then increases again near the top of the formation giving a bimodal distribution in high elemental values. Fe and S do not vary as much within the Second White Specks Formation, but vary much more in the underlying Belle Fourche Formation. This is most likely due to the abundance of pyrite observed within the underlying shales.

No other core within the study represents a full section of core, so they are grouped together into three categories; core that represents the top of the Second White Specks Formation, core that represents the middle of the Second White Specks Formation, and core that represents the base of the Second White Specks Formation.

Core from the first category that represent the top of the Second White Specks Formation include; 00/06-11-061-22W4/0, 00/06-35-059-21W4/0, 00/10-36-060-22W4/0 and 02/06-30-064-01W6/0. There is no consistent geochemical signature observed between these cores, although most of the signatures appear to vary slightly at the top of the Second White Specks Formation, decrease at the contact between formations and then increase into the overlying shales. The variations in 06-35-059-21W4 values may be associated with variations in organic matter within the Second White Specks Formation and the variations within the Belle Fourche may be associated with the presence or absence of siderite and pyrite.

Core from the second category that represent the middle of the Second White Specks Formation include: 00/06-31-046-08W5/0, 00/06-26-059-20W4/0, 00/09-09-056-19W5/0, 00/10-28-059-20W5/0, 00/14-29-048-06W5/0, 02/16-18-064-02W6/0 and 02/16-27-058-20W5/0. Some of the core show a bimodal response, with elements slightly higher near the bottom of the Second White Specks, a lower response in the middle of the formation, and a higher response near the top of the formation. Because the Second White Specks varies so widely across the basin with regards to thickness, it is difficult to compare cores to one another across the basin when a full core with upper and lower contacts is not available.

Core from the third category that represent the base of the Second White Specks Formation include: 00/05-10-051-04W5/0, 00/15-21-056-19W5/0, 02/07-33-052-15W5/0, and 7AS01 (00/06-12-098-12W4/0). There is no single consistent geochemical signature observed within these core, although there maybe a general trend with an increase in values near the base of the Second White Specks Formation.

There does not appear to be a single unique geochemical signature across the basin for the Second White Specks Formation. However, this may partly be due to the lack of a complete core for this unit within the deeper basin. Having said this, organic carbon is much more elevated in the Second White Specks Formation compared to the overlying and underlying shales. As well, the overall metal content appears to increase to the northeast, with core from hole 7BK03 having the highest total organic carbon content and most of the elevated metal concentrations. In places identified in this study, there is a slight bimodal pattern in the unit. This typically is characterized by a slight increase in values of a suite of elements near the base of the formation, a low in values near the central part of the unit, then returning again to higher values closer to the top of the formation.

### 4.4 Aerial Distribution Plots for Selected Metals

Aerial distribution plots for twelve selected elements follow; the elements include; Mo, Ni, Ag, Zn, S, Pb, Co, Ba, Fe, Cu, V and U (Figures 4.5 to 4.16). These plots illustrate the average values of an element across all locations of core that contain the Second White Specks Formation; (that is the elemental values throughout the whole of the Second White Specks interval within a specific core were averaged). Core from the northeastern area of the maps represents the Second White Specks Formation that also exists nearby in outcrop. The plotted results are all from core, although in northeastern Alberta the Second White Specks Formation does crop out in a few places. Furthermore, the results in the northeast and eastern parts of Alberta represent the 'near-shore' part of the formation, whereas those to the west represent a more distal and deeper water facies.

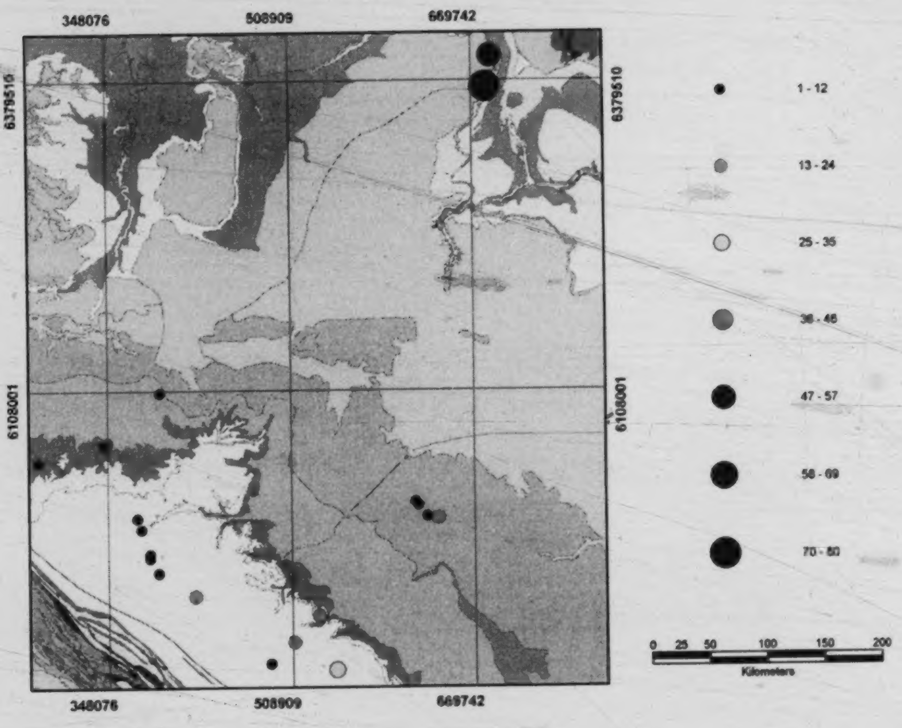
348076
508909
669742
6379510
6108001
1 - 12
13 - 24
25 - 35
36 - 46
47 - 57
58 - 69
70 - 80
0 25 50 100 150 200
Kilometers

**Figure 4.5:** Molybdenum (ppm) aerial distribution for the Second White Specks Formation.

Molybdenum values are highest in the Birch Mountains in northeast Alberta (Figure 4.5). For example, the average Mo value for core from drill hole 7AS01 is 75 ppm and the average value for core from hole 7BK03 is slightly lower at 52 ppm. In contrast, to the southwest the average Mo concentrations are greatly reduced, averaging between 1 to 35 ppm. In summary, there are very high Mo values in northeastern Alberta, with a few moderate Mo values in eastern and southern Alberta and very low values to the west in the deep basin.

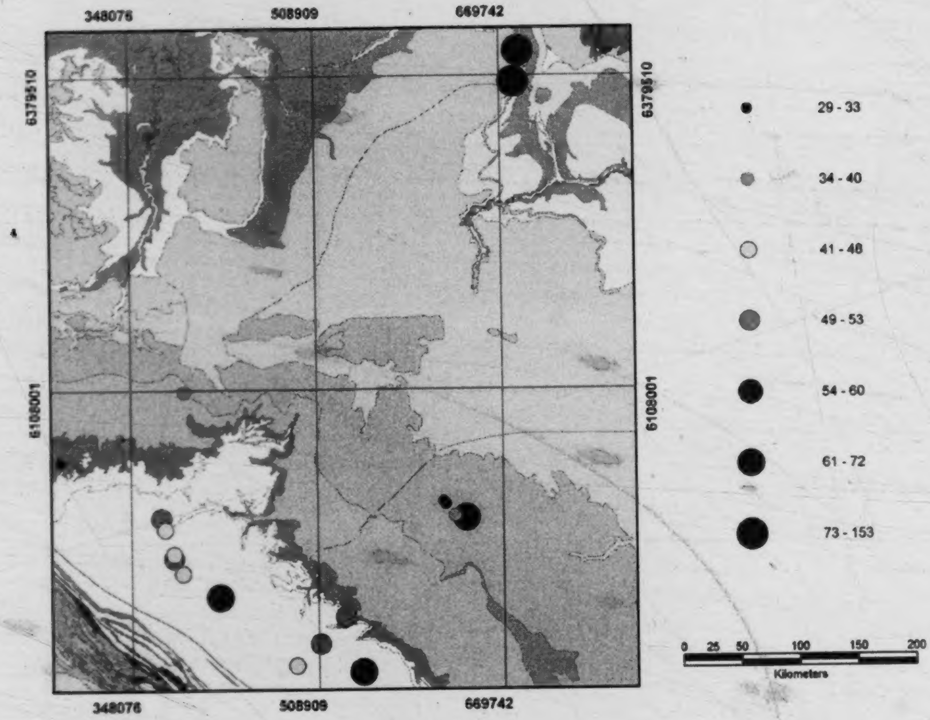
348076
508909
669742
6379510
6108001
29 - 33
34 - 40
41 - 46
49 - 53
54 - 60
61 - 72
73 - 153
0 25 50 100 150 200
Kilometers

Figure 4.6: Nickel (ppm) aerial distribution for the Second White Specks Formation.

Nickel also exhibits high average values in the Birch Mountains cores in northeastern Alberta, averaging from 73 to 153 ppm (Figure 4.6). However, unlike the Mo values, there are also high concentrations of Ni in several places in central and eastern Alberta. Similar to Mo, the lowest average values of Ni are located to the west in the deep basin.

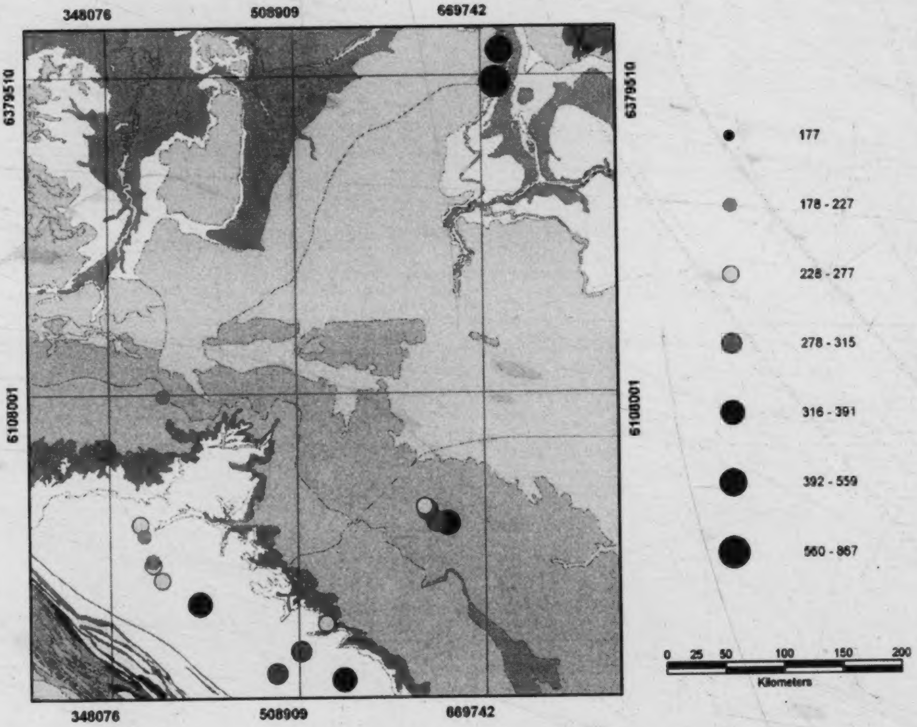
348076
508909
669742
6379510
6108001
177
178 - 227
228 - 277
278 - 315
316 - 391
392 - 559
560 - 867
0 25 50 100 150 200
Kilometers

**Figure 4.7:** Silver (ppb) aerial distribution for the Second White Specks Formation.

As for Ni and Mo, Ag values are highest in the Birch Mountains (Figure 4.7). As well, and similar to the pattern for Ni, Ag has a few moderate values in eastern and central Alberta, with the lowest concentrations for Ag found in the west in the deep basin.

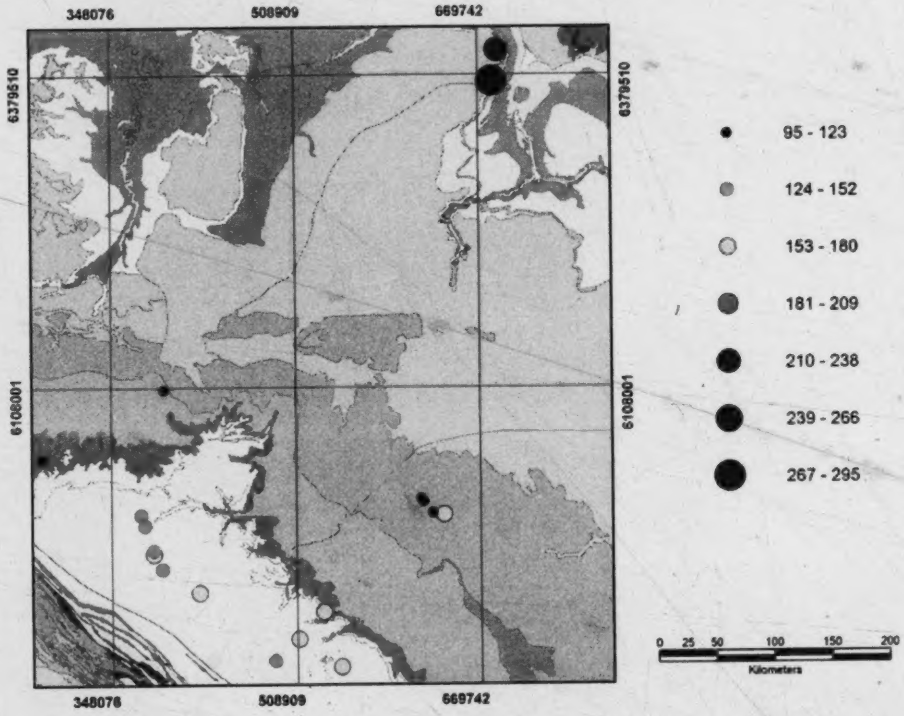
348076
508909
669742
6379510
6108001
95 - 123
124 - 152
153 - 180
181 - 209
210 - 238
239 - 266
267 - 295
0 25 50 100 150 200
Kilometers

**Figure 4.8:** Zinc (ppm) aerial distribution for the Second White Specks Formation.

Zinc mimics the pattern for Mo, Ni and Ag in that it also has the highest values in the Birch Mountains (Figure 4.8). As well, zinc is moderately concentrated in southern Alberta and perhaps least concentrated in the deep basin in the extreme west. In general, the zinc plot most resembles the Mo plot with regards to the aerial distribution of the concentration of the metal.

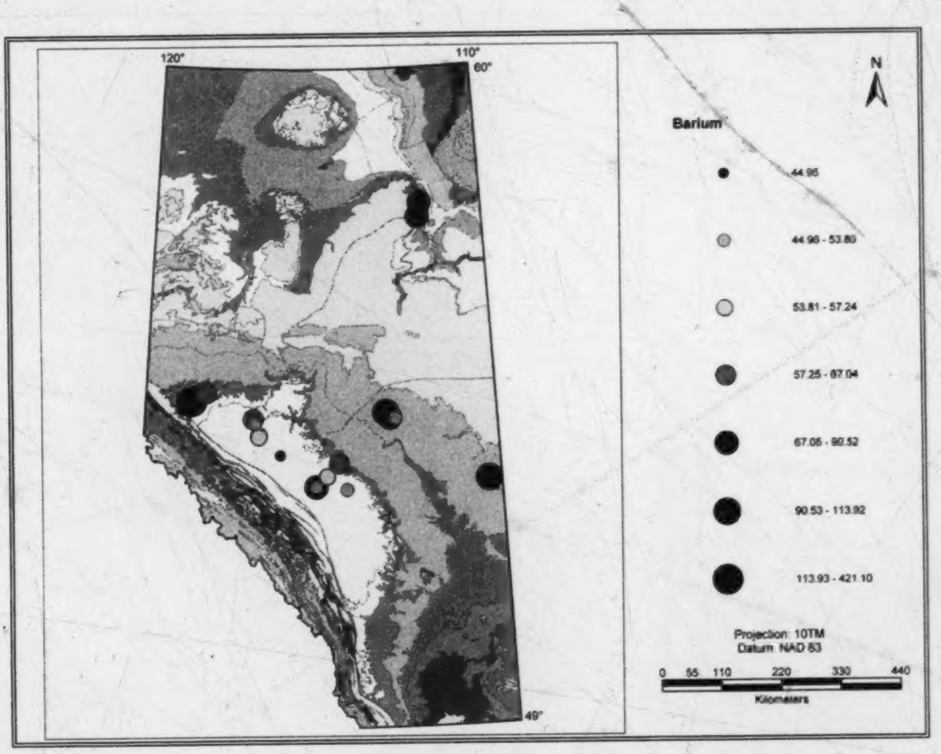
120°
110°
60°
49°
N
Barium
44.95
44.96 - 53.80
53.81 - 57.24
57.25 - 67.04
67.05 - 90.52
90.53 - 113.92
113.93 - 421.10
Projection: 10TM
Datum: NAD 83
0 55 110 220 330 440
Kilometers

**Figure 4.9:** Barium (ppm) aerial distribution for the Second White Specks Formation.

The values for barium have a different aerial distribution than that for Mo, Ni, Ag and Zn (Figure 4.9). For example, the highest values for barium are in the extreme west in the deep basin in core from the hole closest to the deformed belt. As well, other high Ba values exist in east-central Alberta and northeastern Alberta. The lowest Ba values within the Second White Specks Formation are in core from a hole in the central deep basin of Alberta.

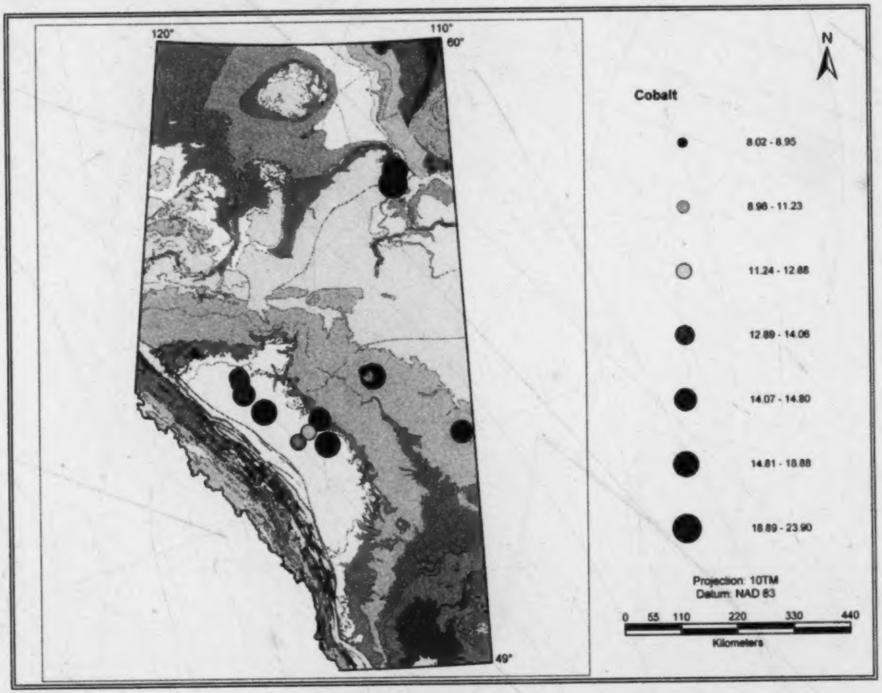
120°
110°
60°
49°
N
Cobalt
8.02 - 8.95
8.96 - 11.23
11.24 - 12.88
12.89 - 14.06
14.07 - 14.80
14.81 - 18.88
18.89 - 23.90
Projection: 10TM
Datum: NAD 83
0 55 110 220 330 440
Kilometers

**Figure 4.10:** Cobalt (ppm) aerial distribution for the Second White Specks Formation.

The values for cobalt are highest in the Birch Mountains and the southern part of the central deeper basin (Figure 4.10). The lowest values are spread throughout western and northwestern part of the deep basin, seemingly scattered among the higher Co values. This pattern for Co thus differs from that exhibited by Mo, Ni, Ag, and Zn, but is perhaps similar to that for Ba.

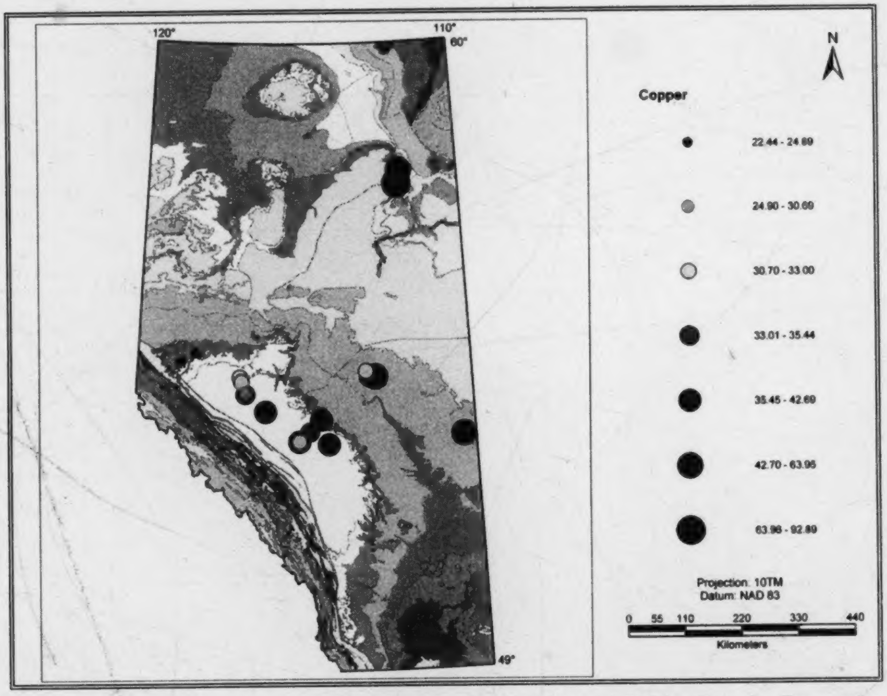
120°
110°
60°
49°
N
Copper
22.44 - 24.89
24.90 - 30.69
30.70 - 33.00
33.01 - 35.44
35.45 - 42.69
42.70 - 63.95
63.96 - 92.89
Projection: 10TM
Datum: NAD 83
0 55 110 220 330 440
Kilometers

**Figure 4.11:** Copper (ppm) aerial distribution for the Second White Specks Formation.

The aerial distribution plot for Cu shows the maximum values occur in northeastern Alberta and east central Alberta (Figure 4.11), whereas more moderate Cu values occur in the central deep basin. The minimum Cu values occur in the center of the study area and in the deep basin in western Alberta.

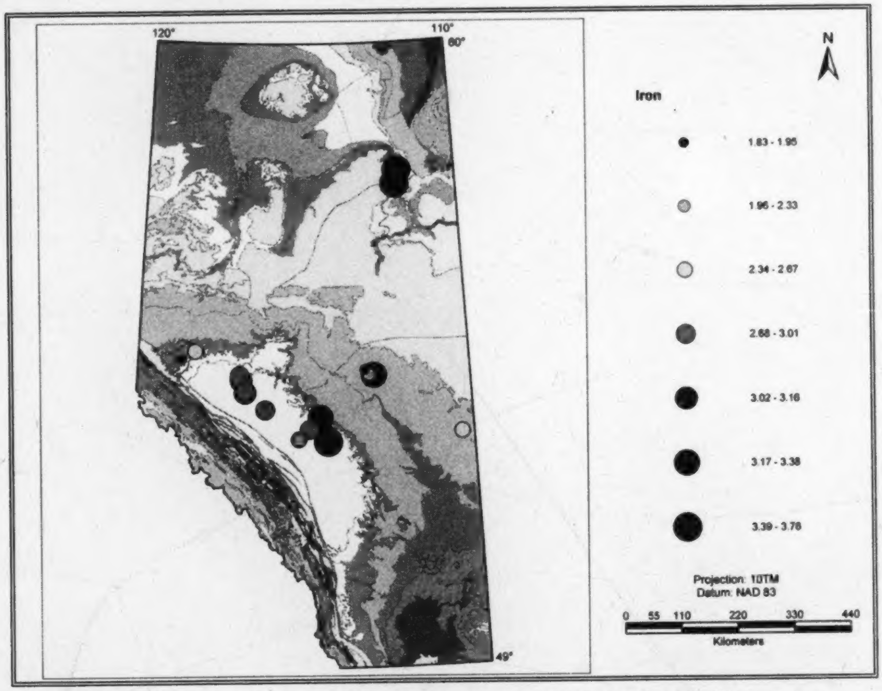
120°
110°
60°
49°
N
Iron
1.83 - 1.95
1.96 - 2.33
2.34 - 2.67
2.68 - 3.01
3.02 - 3.16
3.17 - 3.38
3.39 - 3.78
Projection: 10TM
Datum: NAD 83
0 55 110 220 330 440
Kilometers

**Figure 4.12:** Iron (%) aerial distribution for the Second White Specks Formation.

The aerial distribution plot for Fe also shows the maximum average values occur within the Birch Mountains (Figure 4.12). Moderate Fe values occur within the center of the study area, with the minimum Fe values occurring to the southeast and southwest.

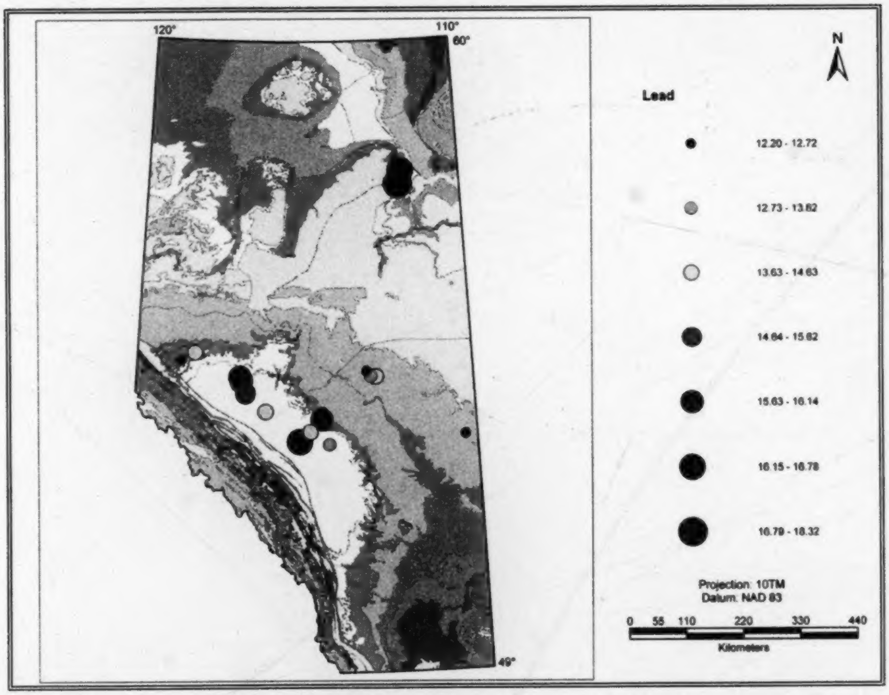
120°
110°
60°
49°
N
Lead
12.20 - 12.72
12.73 - 13.82
13.63 - 14.63
14.64 - 15.62
15.63 - 16.14
16.15 - 16.78
16.79 - 18.32
Projection: 10TM
Datum: NAD 83
0 55 110 220 330 440
Kilometers

**Figure 4.13:** Lead (ppm) aerial distribution for the Second White Specks Formation.

The aerial distribution plot for Pb shows that the highest values are in the Birch Mountains core (Figure 4.13). As for Fe, the moderate Pb values occur in the center of the deep basin, with the lowest values to the southeast and northwest.

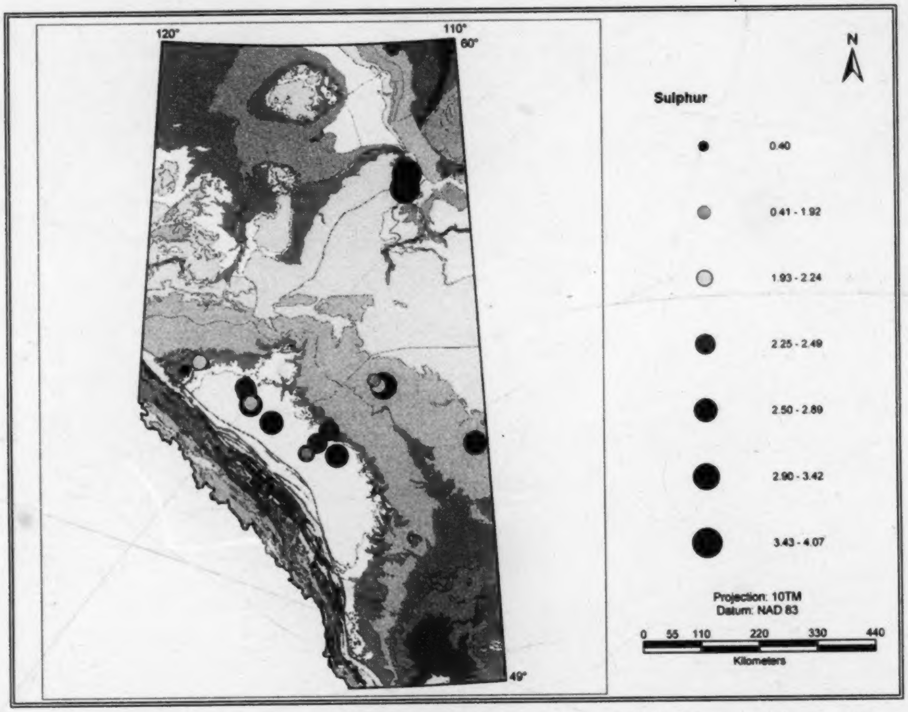
120°
110°
60°
49°
N
Sulphur
0.40
0.41 - 1.92
1.93 - 2.24
2.25 - 2.49
2.50 - 2.89
2.90 - 3.42
3.43 - 4.07
Projection: 10TM
Datum: NAD 83
0 55 110 220 330 440
Kilometers

**Figure 4.14:** Sulphur (%) aerial distribution for the Second White Specks Formation.

The aerial distribution plot for sulphur, as for most of the other elements, shows maximum S values are located the Birch Mountains (Figure 4.14). Moderate S values exist in the core from the south, with the lowest S values being in the western study area.

Plots for both uranium and vanadium (Figures 4.15 and 4.16) show both the highest U and V values are once again within the Birch Mountains core. Moderate U and V values exist to the south and east, with the minimum U and V values being located within the deep basin to the west.

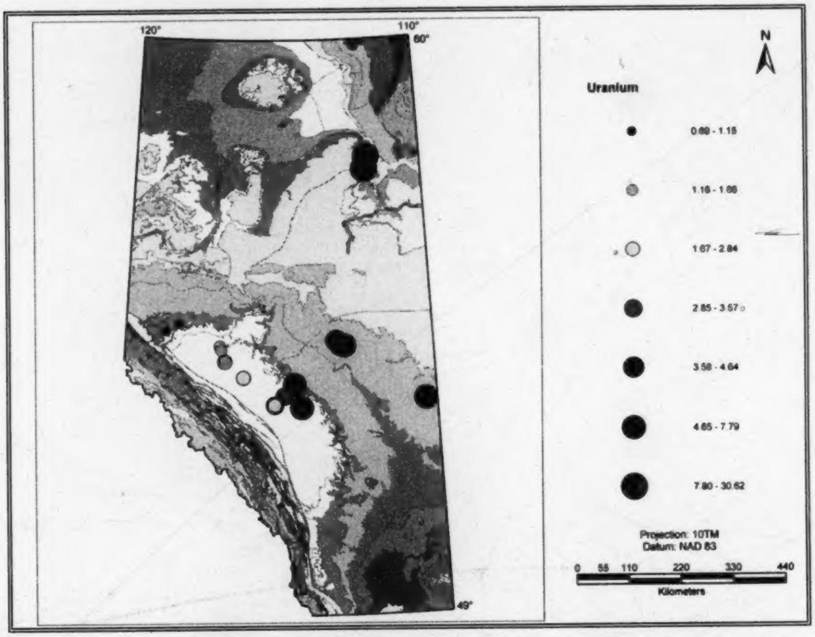
120°
110°
60°
49°
N
Uranium
0.69 - 1.15
1.16 - 1.66
1.67 - 2.84
2.85 - 3.57
3.58 - 4.64
4.65 - 7.79
7.80 - 30.62
Projection: 10TM
Datum: NAD 83
0 55 110 220 330 440
Kilometers

**Figure 4.15:** Uranium (ppm) aerial distribution for the Second White Specks Formation.

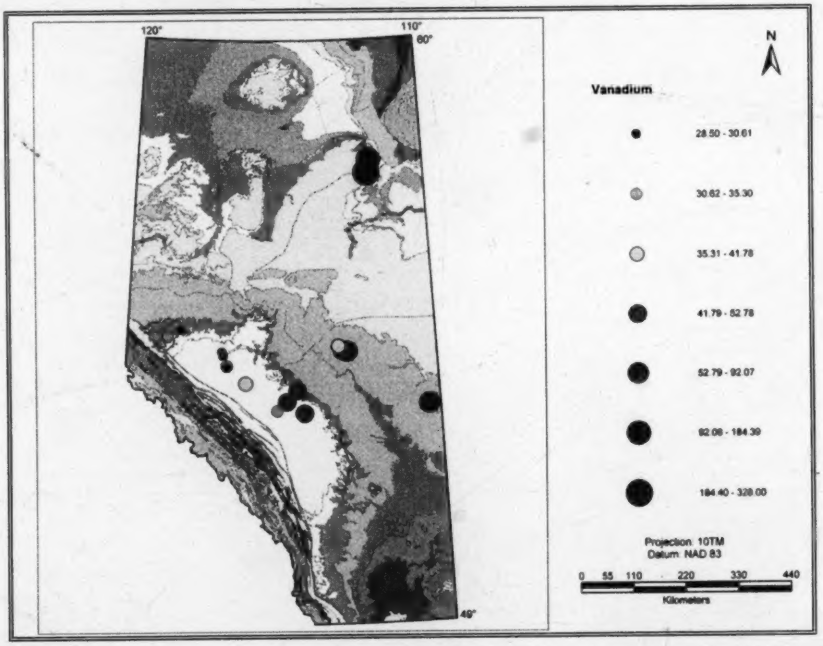
120°
110°
60°
49°
N
Vanadium
28.50 - 30.61
30.62 - 35.30
35.31 - 41.78
41.79 - 52.78
52.79 - 92.07
92.08 - 184.39
184.40 - 320.00
Projection: 10TM
Datum: NAD 83
0 55 110 220 330 440
Kilometers

**Figure 4.16:** Vanadium (ppm) aerial distribution for the Second White Specks Formation.

### *4.4.1 Discussion*

When all of the aerial distribution plots are compared, 11 of the 12 elements have the highest average values within the Birch Mountains core from holes 7BK03 and 7AS01. These elements include Mo (47 to 80 ppm), Ni (73 to 153 ppm), Ag (392 to 867 ppb), Zn (210 to 295 ppm), Co (14.81 to 23.90 ppm), Cu (42.70 to 92.89 ppm), Fe (3.39 to 3.76 %), Pb (16.15 to 18.32 ppm), S (3.43 to 4.07 %), U (7.80 to 30.62 ppm), and V (92.08 to 328.00 ppm). This shows that the Birch Mountains has anomalous elemental concentrations compared to the Second White Specks Formation to the south and west. Barium is the only element that does not follow this trend. That is, barium within the Birch Mountains has an average value, much lower than some of the Second White Specks core observed to the south and the highest average value for barium occurs in the deep basin, closest to the deformed cordilleran belt.

Generally the aerial distributions for Mo, Ni, Ag, Zn, Co, Cu, Fe, Pb, S, U and V have moderate elemental values within eastern and central Alberta, with the lowest average elemental values clustering between the moderate average values, and in some cases extending to the west. Barium again does not show this pattern. That is, for barium the moderate average values occur in northeastern and eastern Alberta, with the lowest average values being in the south and west-central.

The elements which demonstrate the highest values closest to the paleoshoreline to the east include Mo, Cu, V and to a lesser extent S and U. These elements have their lowest average values in the deep basin. Elements that have the highest values within the Birch Mountains and the central deep basin include Pb, Ni, Fe, Co, Zn and Ag, whereas the lowest average values for these elements are in the deepest part of the basin and eastern Alberta.

In summary, the most consistent pattern is that 11 of the 12 elements have their highest values within the Birch Mountains of Alberta. Interestingly, Dufresne et al. (2001) also noted the anomalous metal concentrations in the Second White Specks

Formation in the Birch Mountains. Elsewhere within the study area, average values split into two categories, with some elements more concentrated in the center of the basin, and others more concentrated to the east closer to the paleoshoreline. Barium is the exception in that it shows high values on the peripheries of the study area, with the lowest values being in the center of the study area. Because of this these variations in element distribution, no other conclusions about anomalous elemental concentrations can be made for the Second White Specks Formation outside of the Birch Mountains.

## 4.5 Total Organic Carbon Content

Within this study, most of the geochemistry carried out was inorganic aside from the testing of certain cores for their organic carbon content. The details of the analytical technique for carbon are included in the Methodology in Section 2.1.5. The organic carbon content of the Second White Specks Formation ranges from 0.7 % to 10.82 % with an average of 4.9 %. This is a much higher average total organic carbon content than in the underlying and overlying shales and explains why the Second White Specks Formation has been suggested by Travis (2002) to be a good source rock. The highest organic carbon values came from the Birch Mountains core which have an average organic carbon content of 6.5 % in this study area. However, Bloch et al. (1999) and Leckie (1944) have reported up to 12 weight percent for the total organic carbon content of the Second White Specks Formation. Other cores from this study with elevated organic carbon include: 00/05-10-051-04W5/0, which has an average 4.2 %; 00/06-31-046-08W5/0, which has an average of 2.8 %; 00/10-22-047-03W4/0, which has an average of 6.2 %; 00/14-29-048-06W5/0, which has an average of 3.9 %; 00/16-12-046-03W5/0, which has an average of 3.8 %; and 02/07-33-052-15W5/0, which has value of 3.5 %.

In general, the organic carbon content is highest in the Birch Mountains, followed by moderate to high organic carbon content in core from the eastern parts of the study area. Finally, the core from the deeper basin contains the lowest total organic carbon contents. This trend may be attributed to increased biological activity in eastern Alberta during the time of deposition of the Second White Specks Formation, causing abundant organic matter to be deposited and buried more quickly because of the higher sedimentation rates (Claudia Schröder-Adams, personal communication 2004). However, another possible explanation are the maturity levels of the Second White Specks Formation as illustrated in Figures 4.17 and 4.18. That is, these two figures show the Second White Specks Formation is mature in the deeper basin and immature towards the northeast. Therefore, when the formation started to mature in the west, hydrocarbons may have been expelled from the unit, decreasing the organic carbon content that is now observed.

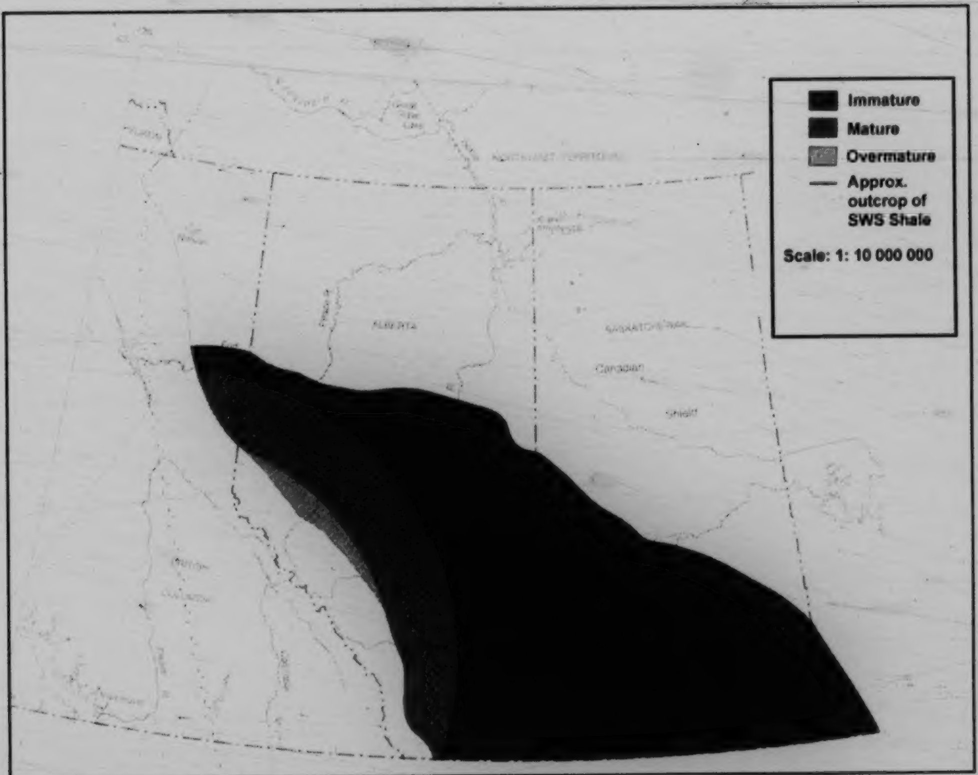
Immature
Mature
Overmature
Approx. outcrop of SWS Shale
Scale: 1: 10 000 000
ALBERTA
SASKATCHEWAN
Canadian Shield
NORTHWEST TERRITORIES

**Figure 4.17:** The Second White Specks petroleum system, showing immature, mature and overmature areas of the shale (from Creaney et al., 1994).

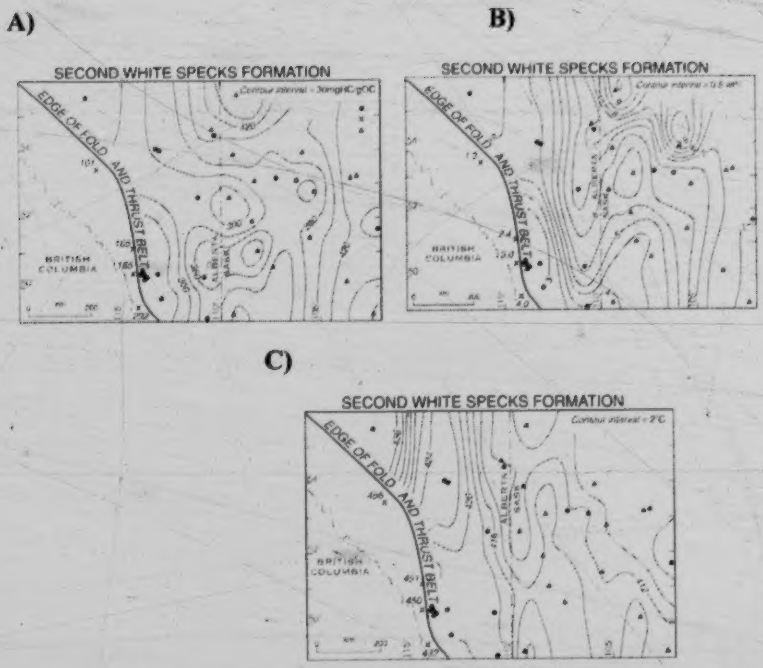
A)
SECOND WHITE SPECKS FORMATION
EDGE OF FOLD AND THRUST BELT
BRITISH COLUMBIA
B)
SECOND WHITE SPECKS FORMATION
EDGE OF FOLD AND THRUST BELT
BRITISH COLUMBIA
C)
SECOND WHITE SPECKS FORMATION
EDGE OF FOLD AND THRUST BELT
BRITISH COLUMBIA

**Figure 4.18:** Second White Specks Formation contour maps for A) hydrogen index (mgHC/gOC); B) total organic carbon (wt %); and C) Tmax (from Bloch et al., 1999)

### 4.6 Black Shale Metal Enrichment

There are a few definitions that are important in this study. One is the definition of a black shale as "a dark-colored, laminated, fine-grained, clastic sediment that contains 50 % or more particles sized less than 0.062mm equivalent spherical diameter (i.e. silt or clay) and greater than 0.5 % organic carbon" (Huyck, in press and Schultz, 1991). It is clear that the Second White Specks Formation fits into this definition. The other definition is that a metalliferous black shale is "a black shale that is enriched in any given metal by 2X (except for beryllium, cobalt, and uranium where 1X is sufficient) relative to the United States Geological Survey Geochemical Standard SDO-1 of Ohio Devonian Shale" (Schultz, 1991). Table 4.16 lists some of the maximum elemental values received in this study, and Table 4.17 provides a comparison between metalliferous black shales and the USGS Geochemical Standard SDO-1.

**Table 4.16:** The table lists some of the maximum values received for the Second White Specks Formation.

| Element: | Maximum Value: | Core: | Analysis: |
|---|---|---|---|
| Ag | 1331 ppb | 7BK03 | Group 1F |
| As | 460 ppm | 00/14-29-048-06W5/0 | Group 1F |
| Au | 6.2 ppb | 7AS01 | Group 1F |
| Ba | 590.8 ppm | 00/14-28-062-05W6/0 | Group 1F |
| Bi | 0.87 ppm | 7BK03 | Group 1F |
| Cd | 313.3 ppm | 00/10-22-047-03W4/0 | Group 1F |
| Co | 44 ppm | 7BK03 | Group 1F |
| Cr | 55.9 ppm | 7AS01 | Group 1F |
| Cu | 139.97 ppm | 00/10-22-047-03W4/0 | Group 1F |
| Fe | 18.26 % | 7BK03 | Group 1F |
| Hg | 727 ppb | 00/05-10-051-04W5/0 | Group 1F |
| Mg | 4.74 % | 00/05-10-051-04W5/0 | Group 1F |
| Mn | 2012 ppm | 7BK03 | Group 1F |
| Mo | 169.15 ppm | 7AS01 | Group 1F |
| Ni | 289.5 ppm | 7BK03 | Group 1F |
| Pb | 36.34 ppm | 7BK03 | Group 1F |
| Pd | 17 ppb | 7BK03 | Group 1F |
| Pt | 9 ppb | 7BK03 | Group 1F |
| S | 22.09 % | 7BK03 | Group 1F |
| U | 69.58 ppm | 7BK03 | Group 1F |
| V | 556 ppm | 7BK03 | Group 1F |
| Zn | 468.9 ppm | 7BK03 | Group 1F |
| Cr | 141.6 ppm | 00/10-22-047-03W4/0 | Group 1EX |
| V | 1275 ppm | 7BK03 | Group 1EX |
| Zn | 481 ppm | 7BK03 | Group 1EX |
| Dy | 33.17 ppm | 00/10-22-047-03W4/0 | Group 4B |
| Ba | 12054 ppm | 7BK03 | Group 4A |
| C-org | 10.82 % | 7BK03 | CO2 |

A plot has been made to compare how 'metal rich' the Second White Specks Formation is compared to average shales listed by Mason (1982) and the USGS (see Table 4.17 for values and Figures 4.19 and 4.20 for the plots).

**Table 4.17:** Shale concentrations for multiple elements.

| **Elements** | **Mason Shale Values (%)** | **USGS Values (%)** | **Average SWS Values (%)** | **Average 7BK03 Values (%)** |
|---|---|---|---|---|
| SiO2 | 58.4 | 49.3 | 51.3 | 49.5 |
| TiO2 | 0.8 | 0.7 | 0.6 | 0.5 |
| Al2O3 | 15.1 | 12.3 | 13.4 | 11.8 |
| Fe2O3 | 6.7 | 9.3 | 5.1 | 5.2 |
| MnO | 0.1 | 0.04 | 0.02 | 0.04 |
| MgO | 2.5 | 1.5 | 1.6 | 1.5 |
| CaO | 3.1 | 1.1 | 7.2 | 7.1 |
| Na2O | 1.3 | 0.4 | 0.6 | 0.7 |
| K2O | 3.2 | 3.4 | 2.4 | 2.0 |
| P2O5 | 0.2 | 0.1 | 0.3 | 0.5 |

| | **Mason Shale Values (ppm)** | **USGS Values (ppm)** | **Average SWS Values (ppm)** | **Average 7BK03 Values (ppm)** |
|---|---|---|---|---|
| Li | 66 | 28.6 | 15.1 | 18.8 |
| Be | 3 | 3.3 | 0.8 | 10 |
| B | 100 | 128 | 11.8 | 19.0 |
| C | 1000 | 99500 | 60959.6 | 76528.6 |
| N | 60 | N/A | N/A | N/A |
| F | 740 | 0.01 | N/A | N/A |
| S | 2400 | 53500 | 25176.9 | 40153.6 |
| Cl | 180 | 116 | N/A | N/A |
| Sc | 13 | 13.2 | 4.5 | 3.9 |
| V | 130 | 160 | 356.8 | 617.3 |
| Cr | 90 | 66.4 | 15.8 | 20.0 |
| Co | 19 | 46.8 | 14.1 | 18.9 |
| Ni | 68 | 36.6 | 56.0 | 109.9 |
| Cu | 45 | 60.2 | 39.9 | 64.0 |
| Zn | 95 | 64.1 | 154.4 | 219.6 |
| Ga | 19 | 16.8 | 3.1 | 4.6 |
| Ge | 1.6 | 1.3 | 0.17 | 0.18 |
| As | 13 | 68.5 | 30.2 | 47.4 |
| Se | 0.6 | 3 | 5.6 | 24.3 |
| Br | 4 | 5 | N/A | N/A |
| Rb | 140 | 126 | 95.1 | 13.5 |
| Sr | 300 | 75.1 | 119.0 | 177.1 |
| Y | 26 | 40.6 | 24.2 | 39.7 |
| Zr | 160 | 165 | 8.4 | 20.0 |
| Nb | 11 | N/A | 0.2 | 0.5 |
| Mo | 2.6 | 134 | 17.5 | 54.4 |

| | | | | |
|---|---|---|---|---|
| Ru | <0.01 | N/A | N/A | N/A |
| Rh | <0.01 | N/A | N/A | N/A |
| Pd | <0.01 | N/A | < 10 | < 10 |
| Ag | 0.07 | 0.09 | 0.3 | 0.6 |
| Cd | 0.3 | 2 | 1.8 | 7.3 |
| In | 0.1 | 0.2 | 0.04 | 0.05 |
| Sn | 6 | 2.9 | 0.7 | 1.1 |
| Sb | 1.5 | 4.1 | 1.5 | 5.7 |
| Te | <0.01 | N/A | 0.1 | 0.2 |
| I | 2.2 | N/A | N/A | N/A |
| Cs | 5 | 6.9 | 7.4 | 0.6 |
| Ba | 580 | 397 | 86.1 | 75.1 |
| La | 24 | 38.5 | 9.7 | 32.0 |
| Hf | 2.8 | 4.7 | 3.8 | 4.4 |
| Ta | 0.8 | 1.1 | < .05 | < .05 |
| W | 1.8 | 3.3 | < .1 | < .1 |
| Re | <0.01 | N/A | 0.1 | 0.3 |
| Os | <0.01 | N/A | N/A | N/A |
| Ir | <0.01 | N/A | N/A | N/A |
| Pt* | <0.01 | N/A | <0.01 | 0.004 |
| Au | 0.003 | 0* | 0.0009 | 0.002 |
| Hg | 0.4 | 0.19 | 0.1 | 0.1 |
| Tl | 1 | 8.3 | 0.6 | 3.2 |
| Ce | 50 | 79.3 | 31.8 | 53.0 |
| Pr | 6.1 | 6 | 9.7 | 11.4 |
| Nd | 24 | 11.4 | 38.5 | 48.0 |
| Sm | 5.8 | 7.7 | 7.4 | 9.5 |
| Eu | 1.1 | 1.6 | 1.5 | 1.8 |
| Gd | 5.2 | 6.5 | 6.5 | 9.2 |
| Tb | 0.9 | 1.2 | 1.0 | 1.4 |
| Dy | 4.3 | 5.7 | 5.8 | 8.2 |
| Ho | 1.2 | 1.1 | 1.1 | 1.5 |
| Er | 2.7 | 2.5 | 3.2 | 4.3 |
| Tm | 0.5 | 0.34 | 0.5 | 0.6 |
| Yb | 2.2 | 3.4 | 3.0 | 3.8 |
| Lu | 0.6 | 0.52 | 0.4 | 0.6 |
| Th | 12 | 10.5 | 4.9 | 6.3 |
| U | 3.7 | 48.8 | 5.5 | 21.2 |
| Pb | 20 | 27.9 | 15.1 | 16.8 |
| Bi | 0.4 | 2 | 0.3 | 0.4 |
| C-org | N/A | 96800 | 48492 | 65428 |

Estimated average composition of shale (Mason, 1982), Lentz (2003)
USGS Values from Schultz (1991)

*Pt values below LDL set to 1/2 LDL
Au set to 0.00001 for graphical purposes

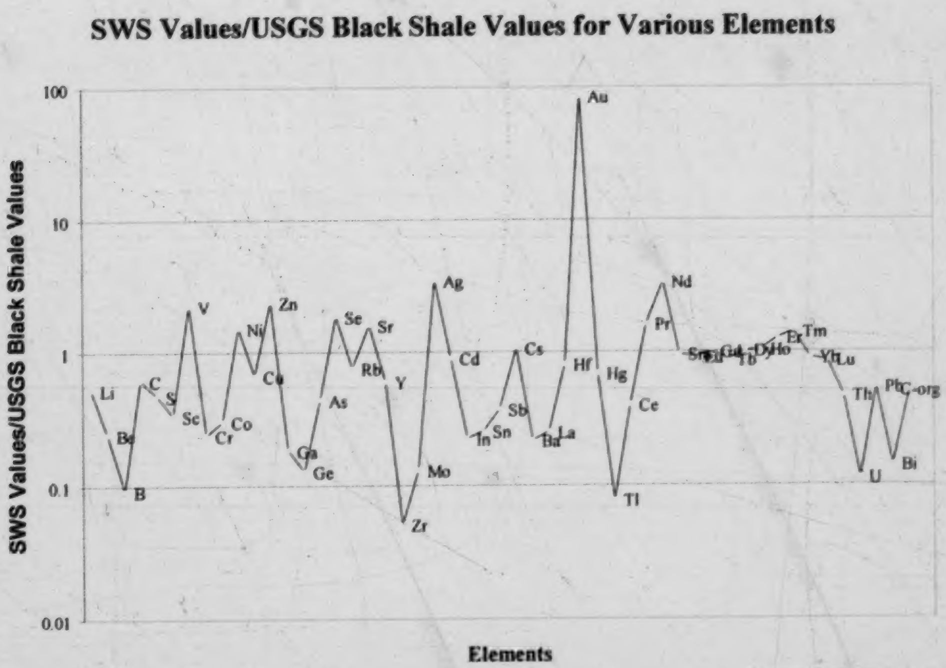

**Figure 4.19:** A plot of average Second White Specks Formation values/USGS black shale values from Table 4.17 for each element. Any element that has a ratio >1 has an enrichment of that metal in the Second White Specks Formation.

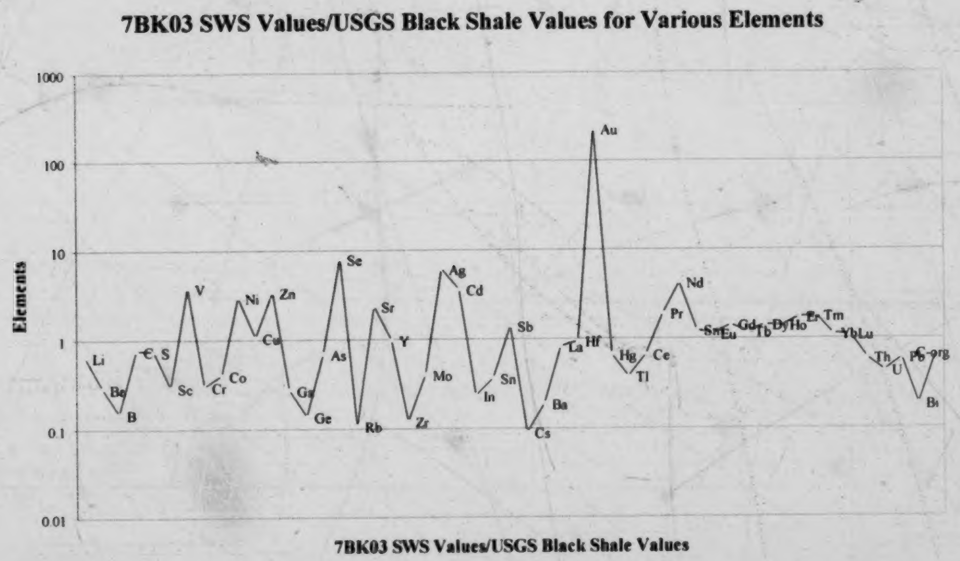

**Figure 4.20:** A plot of average shale in core from hole 7BK03 Second White Specks Formation values/USGS black shale values from Table 4.17 for each element. Any element that has a ratio >1 has an enrichment of that metal in the 7BK03 Second White Specks Formation core.

Once these results are plotted, it is evident that the Second White Specks Shale fits the definition of Schultz as a metalliferous black shale. The values for V, Zn, Nd, Au and Ag are clearly 2x the values stated by the USGS. The same elevated trend can be observed by the Second White Specks Formation in northeastern Alberta, represented by 7BK03 with even more elements that are enriched: V, Ni, Zn, Se, Ag, Cd, Au and Nd.

Another definition of a metalliferous black shale is given in Huyck (in press) as:

$$[(V + Cr + Co + Ni + Cu + Zn + Mo + Ag + Cd + Pb + U) + (As + Se + Sb + Ti) + (Ba + Mn + REE + Zr)/5] > 1000$$

Once the average Second White Specks Formation values are inserted into the equation, the result is as follows:

$$[(356.84615 + 15.818692 + 14.138629 + 55.995327 + 39.902025 + 154.38255 + 17.5381 + 0.3116105 + 1.804891 + 15.050935 + 5.5409969) + (30.224299 + 5.6077882 + 1.5206854 + 0.0039277) + (86.054517 + 121.79439 + 9.6959375 + 31.823404 + 9.7428846 + 38.5 + 7.3923077 + 1.4667308 + 6.5453846 + 1.0436538 + 5.7976923 + 1.1401923 + 3.1671154 + 0.4778846 + 3.0338462 + 0.4482692 + 69.809615)/5] = 794.3$$

Therefore, using Huyck's mathematical definition of a metalliferous black shale, the Second White Specks Formation does not fit, although it is fairly high. However, if the maximum values for the Second White Specks Formation were substituted into the equations, the shale would become a metalliferous shale.

By comparing the two definitions it would appear that the Second White Specks Formation does have some anomalous metal concentrations compared to other shales, but not throughout the whole suite of elements. To investigate how the Second White Specks Formation compares to average shale values published by Mason (1982), Second White Speckled Shale values divided by Mason's (Ibid) average shale were plotted and a comparison was made (Figures 4.21 and 4.22). The Second White Speckled Shale, when compared to average shale values, is elevated in most elements. The Formation in northeastern Alberta is elevated to an even higher extent. Therefore, compared to Mason's (1982) average shale values, the Second White Specks Formation is elevated in many of plotted elements.

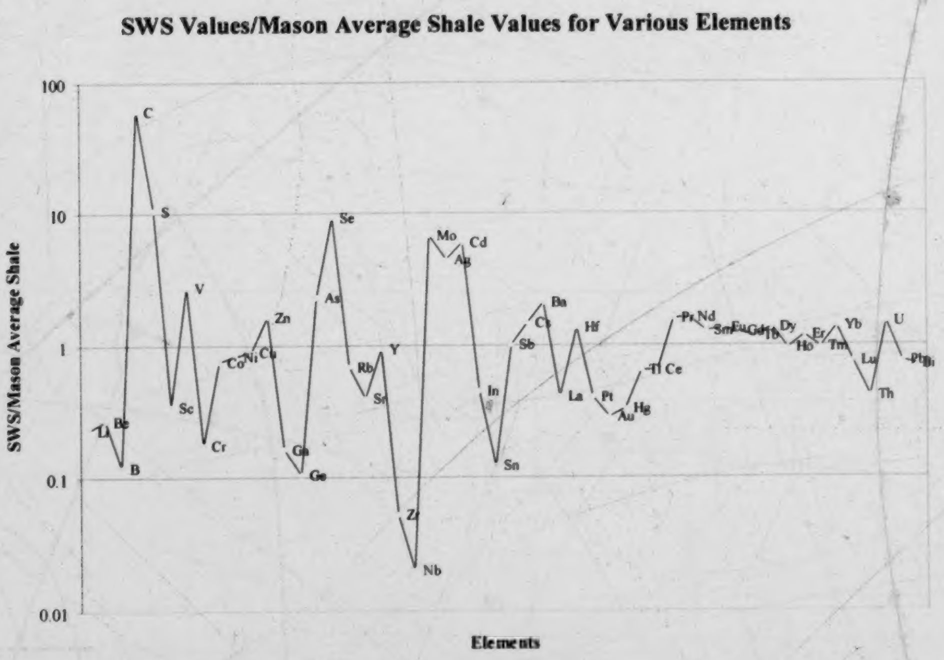

**Figure 4.21:** A plot of average Second White Specks Formation values/Mason average shale values from Table 4.17 for each element. Any element that has a ratio >1 has an enrichment of that metal in the Second White Specks Formation compared to Mason's values.

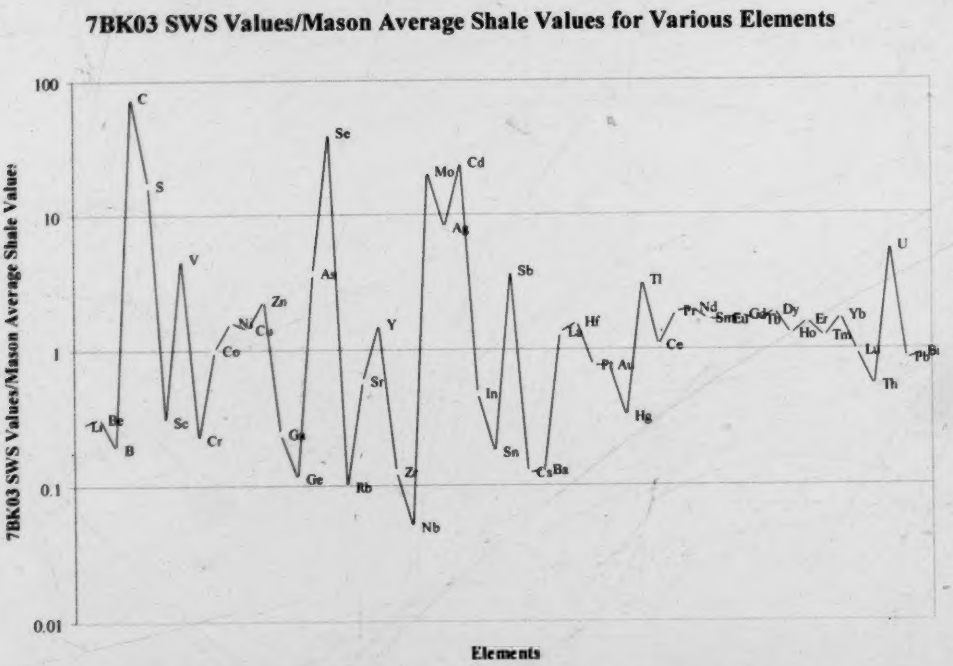

**Figure 4.22:** A plot of average 7BK03 Second White Specks Formation values/Mason average shale values from Table 4.17 for each element. Any element that has a ratio >1 has an enrichment of that metal in the 7BK03 Second White Specks Formation core compared to Mason's values.

## 4.7 Discussion

Brumsack (1980) noted that there are four possible ways for metals to accumulate in Cretaceous sediments: (1) precipitation in marginal basins; (2) from hydrothermal solutions; (3) during marine organism's metabolism; and (4) deposition from normal seawater. He gives examples of each, where type (1) is represented by the Kupferschiefer deposit in Europe where proportions of Pb, Ag, Cu and Zn are comparatively much higher than in the average Atlantic black shales or in the shales of this study. Having said this, the possibility cannot yet be ruled out for metals also to have been concentrated in the Second White Specks Formation within Alberta by one or more of mechanisms of hydrothermal solutions, marine organism metabolism and from normal sea water.

### *4.7.1 Ore Bodies vs. Sea Water*

Table 4.18 provides a comparative summary table of Sedex, Mississippi Valley, Ni-Mo type deposits and sea water. All four genetic models are processes that can produce the anomalous concentrations of metals observed in some shales. The reason why the Mississippi Valley type deposits are included within this study is due to the fact that the Second White Specks Formation equivalent to the east (towards Manitoba) is the Favel Formation which is a carbonate (refer to Figure 4.17). To the south of the border, the Second White Specks Formation also becomes more carbonaceous, and may be a possible Mississippi Valley type deposit rather than a Sedex type deposit.

**Table 4.18:** Summary table showing the differences and similarities between three sediment hosted deposit types and sea water.

| | **Sedex** | **MVT** | **Ni-Mo** | **Sea Water** |
|---|---|---|---|---|
| Examples: | •Australia: Mt Isa, McArthur Basin and Broken Hill<br>•Canada: Cirque, Sullivan, Howard's Pass and Driftpile<br>•USA: Red Dog | •Canada: Pine Point, Polaris, Monarch-Kicking Horse deposits<br>•Upper Mississippi Valley | •Nick, Yukon, Canada<br>•Southern China | •Cretaceous black shales from the Atlantic ocean |
| Primary Elements: | •Pb, Zn, Ag, Ba, Cu | •Pb, Zn, F, Ba | •Ni, Mo, Zn, PGEs, Cu, Au, Pt, Pd | •Most metals and elements |
| Host: | •Clastic or other sedimentary rock (typically shale or siltstone) | •Carbonate Breccias<br>•Usually dolostone or dolomitized limestone | •Black shales | •Any sediments |
| Description: | •Ores are usually lense shaped<br>•Galena, sphalertie, barite, chalcopyrite, sulphosalts +/- pyrite, marcasite, pyrrhotite | •Sulphides usually fill cavities in the brecciated host rock<br>•Pyrite, sphalerite, galena, dolomite | •Layers of pyrite, vaesite, jordisite, wurtzite, sphalerite…<br>•May be a hydrothermal source<br>• Bitumen and barite may be present | •May have associated metals due to marine organism metabolism |
| Tectonic Settings: | •Deep marine and epicontinental to shallow marine<br>•Usually associated with wither growth faults, syndepositional block faults, rifts | •Orogenetically inactive platforms<br>•Relatively undisturbed basins, or foreland fold and thrust belts | •Continental platform<br>•Often have a spatial association with growth/reactivated faults | •Any setting |
| Environment: | •Second or third order basins<br>•Often oxygen-starved marine basins | •Marine platformal carbonates | •Sedimentary sequences<br>•Anoxic, black shales<br>•Between platform shelf carbonates and deeper clastic marine sediments | •Marine settings |
| Age: | •Proterozoic - Cretaceous | •Proterozoic - Cretaceous | •Post Archean – Late Precambrian to Phanerozoic | •Any age |
| Geochemical Signature: | •Usually zoned; Pb closest to vent, grading to more Zn | •Abundant dolomite, elevated Zn and Pb but typically within | •Elevated: Ni, Mo, Au, PGE, C, P, Ba, Zn, Re, Se, As, U, V, | •May show a heavy metal enrichment relative to average shale of |

| | | | | |
|---|---|---|---|---|
| | rich facies away<br>•Cu is usually close to the feeder zone<br>•Barite, chert and hematite are the distal facies | or very close to the mineralized zone | S | Pb<Co<Cr<Ni<Cu<V<Zn<Mo<Ag |
| Grade and Tonnages: | •Average: 41.3Mt<br>•Average grades: 6.8 % Zn, 3.5 % Pb, 50 g/t Ag[1]<br>•High tonnage, moderate grade | •Usually 1-10Mt<br>•Usually between 5-10 % Pb + Zn[2]<br>•Most are Zn rich-relative to Pb<br>•Low tonnage, moderate grade | •Grades often are in % for at least two of: Ni,Mo or Zn<br>•China (Zunyi): ~4 % Mo, up to 4 % Ni, 2 % Zn, 0.7 g/t Ag, 0.3 g/t Pt, 0.4 g/t Pd[3]<br>•Large tonnages<br>•Not always economic | •Various grades, but can be very widespread<br>•Some mean values given for black shales with >1% organic carbon are:<br>6.8 % C-org, 2.19 % S, 910 ppm Mn, 828 ppm Zn, 156 ppm Cu, 202 ppm Cr, 186 ppm Ni, 16 ppm Pb, 822 ppm V, 59 ppm Mo, 4.5 ppm Ag, 530 ppm Ba [4] |
| Other Comments: | •Stratiform<br>•Usually has a vent complex, bedded ores and distal hydrothermal products | •Epigenetic, but can be strata-bound on a district scale (often in clusters)<br>•Sulphide zone may be irregular in shape<br>•Often organic material is present | •Soft sediment deformation often observed<br>•Layered<br>•Often thin ore zones | |

[1] From: Lydon, 1996; [2] From: Sangster, 1996; [3] From: Lefebure, 1995; [4] From: Brumsack, 1980
Sedex from : Olson, 1994, MacIntyre, 1995, Lydon 1996; MVT from: Olson, 1994, Sangster, 1996 and Ni-Mo from: Lefebure, 1995, Olson, 1994, Hulbert, 1996

Mississippi Valley type deposits were included within this study, because the Second White Specks Formation grades into limestones toward Manitoba and may be an economic deposit in the carbonates, outside of the study area of this project. The first three deposit types in Table 4.18 are all formed by or associated with deposition of metals and related gangue minerals by hydrothermal solutions. In contrast, the fourth has metal enrichment occur by deposition due to normal sea water processes. The average values for metals in the Second White Specks Formation from this study may correspond best with deposition by seawater metal enrichment and organism metabolism. This interpretation also is supported by the Second White Specks Formation having a high total organic carbon content with the two being related. Another factor supporting this genetic interpretation is that the metal enrichment seems to be widespread across the basin. In contrast, the Sedex, MVT and Ni-Mo deposit type models require a restricted area in which mineralization occurred. In addition, the ore grades tend to be in the percentages for the economic parts of the Sedex, MVT and Ni-Mo deposit types, whereas most elemental values for the Second White Specks Formation are in the ppm or ppb range. Maximum values from this study include 469 ppm Zn, 36 ppm Pb, 290 ppm Ni and 169 ppm Mo, are much lower than the percentages levels found at economic Sedex and Ni-Mo type deposits. No mineralized horizons were observed within the core, aside from very thin pyrite laminations.

Nonetheless, there does exist the anomalous metal concentrations in the core from the Birch Mountains in north eastern Alberta, as was demonstrated for the Second White Specks Formation in the aerial distribution plots. These plots show that almost all metal and elemental values are higher in the core from the Birch Mountains, although most are not in the percentage range. There are a few possible explanations for this. One is that the elevated organic carbon content observed further north is related to the elevated metal concentrations. This could simply be a normal seawater trend, or a result of carbon scavenging metals from later diagenetic fluids. A second possibility is that the Birch Mountains location was a restricted 2nd or 3rd order basin and the elevated metals result from syngenetic or diagenetic hydrothermal fluids. This hypothesis is supported by palynology data that indicate species from the Birch Mountains area represent a restricted basin setting. There may also have been a hydrothermal imput, allowing for the concentration of metals and the formation of metalliferous shales that are precursors to or weakly mineralized examples of the types Sedex or Ni-Mo deposit types. However, no feeder or brecciated zones were identified during this study. This may indicate that although there may be a Sedex Ni-Mo deposit, it likely will not be economic. In fact, most Ni-Mo deposits that have been described are not of an economic grade (aside from those in China). Having said this, if a strong hydrothermal source existed some place in northeastern Alberta, the Second White Specks Formation would have been deposited in the ideal environment for a Sedex/Ni-Mo type deposit.

Some similarities and differences exist between the Second White Specks Formation and known Sedex deposits. A comparison between the Red Dog deposit and the Second White Specks Formation is examined. Firstly, the Red Dog deposit is Mississippian-Pennsylvanian in age and hosted within a black shale in Alaska (Moore, 1986). The Second White Specks is slightly younger and is Cretaceous in age, deposited across the whole Western Canada Sedimentary Basin (therefore is much more expansive), but is also a black carbonaceous shale. The Red Dog deposit has been shown to have a brecciated zone, transitional zone and stratiform zone in four vents which were later deformed by the Brooks Range orogeny (Edgerton, 1997). The Second White Specks Formation does have lenses and laminations of pyrite and carbonaceous material. Red Dog was later deformed by thrust plates (Lange et al., 1985) with the latest stage of mineralization being represented by minor sulphides and barite, with the overlying Upper Pennsylvanian zones barren of Zn-Pb mineralization (Edgerton, 1997). Although the Second White Specks Formation was deposited within the main basin, it is deformed to the west (foothills), and could have been deposited within restricted basin in what is now the Birch Mountains area. Lang et al., (1985) note that sulphides can be observed in zones several 1000 ms long, with thicknesses up to 10s of ms in the Red Dog deposit. The Second White Specks Formation also shows widespread accumulation of pyrite. Moore et al., (1986) note that the sulphides observed at Red Dog include sphalerite, pyrite, marcasite and galena with the dominant gangue minerals as quartz, barite and shale. The Red Dog deposit is a known Sedex deposit with reserves of 150 Mt with average grades of 16.2% Zn, 4.4% Pb and 110 g/t Ag (Edgerton, 1997). Although Red Dog has very high ore grades and mineralization concentrations, there are similarities with the thin laminations of pyrite observed in the Second White Specks Formation and the "peripheral" stratiform deposits of the Red Dog deposit, which have very low concentrations of metals. The Second White Specks also contains barite, and may therefore be similar to the last stage of mineralization of the Red Dog deposit which contains barite and low concentrations of sulphides.

The Sedex footprint, exploration guide and geochemical signature includes zoning with Pb closer to vent, and decreasing laterally and vertically to Zn rich rock (MacIntyre, 1995). He (Ibid) also notes that Cu is found close to the hydrothermal venting zone, with barite, chert and/or hematite in the distal rock, much further away from venting. It is therefore possible that the Second White Specks Formation in the Birch Mountains zone is a distal signature for a Sedex deposit. Stratiform facies (like what is observed in the Second White Specks Formation) is often indicative of the periphery of a deposit as is noted in the Red Dog orebody (Edgerton, 1997). Further work must be done in the vicinity of the Birch Mountains to determine if there are any vents/feeder zones with higher metal concentrations which would indicate a Sedex deposit. An airborn and ground geophysical survey may help to locate elevated sulphide concentrations.

Irregardless of whether or not the Second White Specks hosts an economic metalliferous mineral deposit, it still is a metalliferous black shale. The data herein show that the Second White Specks Formation has elevated organic carbon and metal contents compared to the overlying and underlying shales. The data also indicate that the Second White Specks has an increase in metal concentration near the base and the top of the formation, with lower values near the center of the formation. Having said this, the core study did not discern any visible physical explanation for these metal variations (i.e.: brecciation, feeder zones, vents). Therefore, within the Second White Specks unit, the connection is most likely with the organic carbon content. That is, organic carbon is concentrated within the Second White Specks Formation as compared to the overlying and underlying units, and there is an increased total organic carbon content within the formation near its base and top. Thus, the organic carbon content appears to be directly related to the abundance of metals observed in the formation in this study.

Figures 4.21 and 4.22 show that with respect to the maturity levels of the Second White Specks Formation, where the formation is immature to the east and northeast also are the locales with a higher organic carbon content in core. This could be due to multiple factors, such as varying biogenic activity and sedimentation rates. There also is a possibility that to the west and southwest, the mature and overmature Second White Speckled Shale may have lost some of the organic carbon content through expulsion of hydrocarbons.

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## 5.0 GENERAL DISCUSSION AND CONCLUSIONS

The regional study of the Second White Specks Formation was challenging, not only because it varies lithologically, markedly across the basin within Alberta, but also because it is difficult to obtain cored sections across the entire unit at some satisfactory spacing. Nonetheless, this study was able to extend the previous knowledge of the formation in southern and central Alberta into central and northern Alberta, and to look at the geochemical signature, both organic and inorganic, of the unit.

The results from this study provide a large amount of new information with regards to the sedimentology, geochemistry and stratigraphy of the Second White Specks Formation in northern and central Alberta. This information includes data from logged and sampled core, palynology, micropaleontology, stratigraphy, and organic and inorganic geochemistry.

Sea level was rising during the Belle Fourche Formation transgression, and reached the maximum flooding surface during the start of the deposition of the Second White Specks Formation. A low energy environment deposited shale, and abundant organic matter was preserved due to the anoxic environment created by the intermixing of warm ocean waters from the south and cool ocean waters from the north. This intermixing limited the biota, being hospitable mainly to planktic foraminifera, but less hospitable to benthic foraminifera. Due to the lack of bioturbation at the base of the Second White Specks and bottom water anoxia, the organic matter was preserved, which is reflected by a high total organic carbon content in the geochemical data. The highest total organic carbon was preserved in the northeast part of the basin due to the proximity of the core to the paleoshoreline and possibly also to increased bioactivity in the seawater at the time of deposition. As well, and probably largely due to the environment of deposition being favorable to the preservation of organic carbon, metals were also concentrated from sea water. Finally, the pyrite nodules and laminations that are present could be due to marine organism metabolism.

As the sea level continued to rise during the ensuing highstand, the low energy environment of deposition remained fairly stable during the Second White Specks formation time. Slightly less organic matter was preserved during this later time, and a lower concentration of metals was also concentrated by normal sea water. The bottom waters remained fairly anoxic, and bioturbation is rare to non existent. Fish debris, *Inoceramus* shells and fecal pellets containing coccoliths were concentrated into laminations. Contour currents acted on the basin floor to move the grains of fine-grained sand and silt into laminations and ripples.

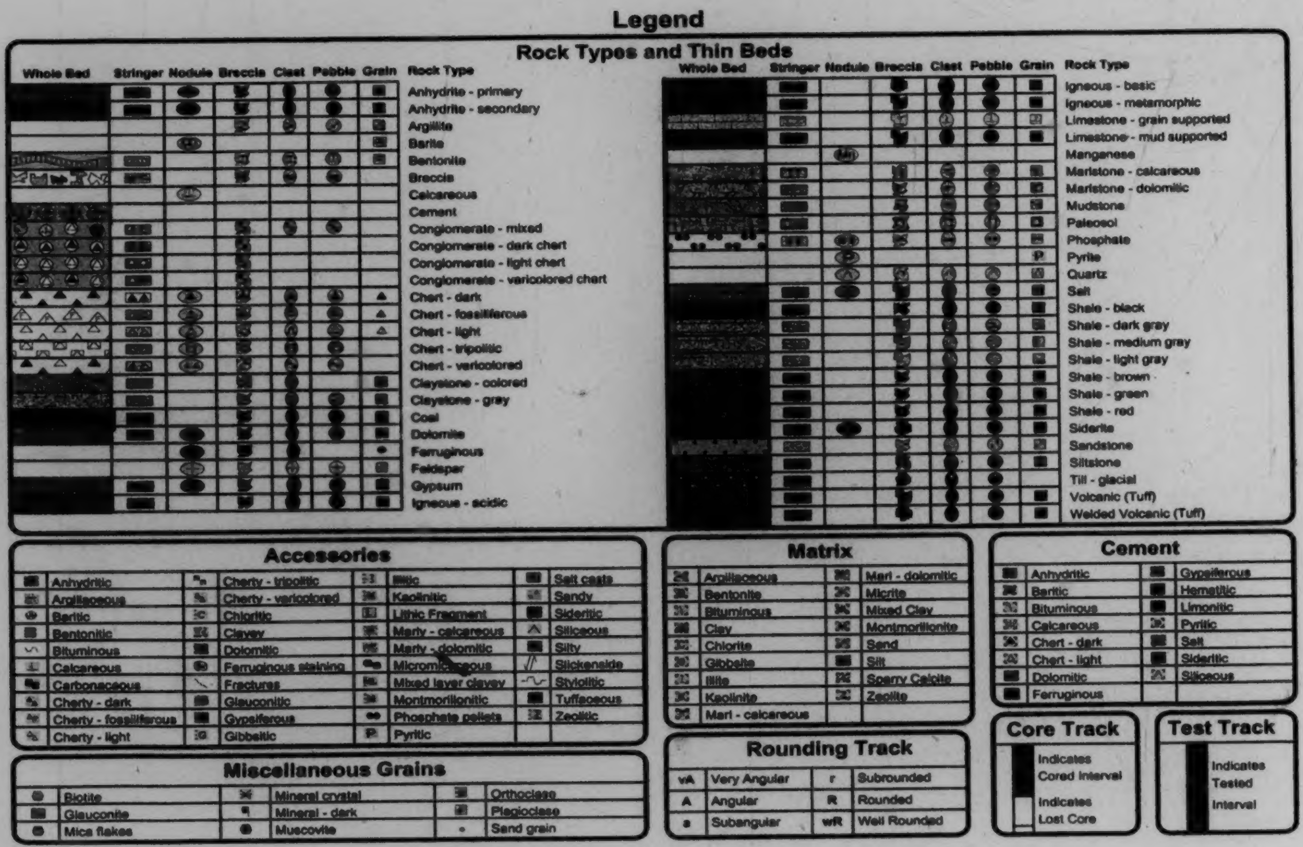
Near the top of Second White Specks Formation, there is evidence that slightly more organic matter is preserved. This is reflected by the higher organic carbon concentrations and correspondingly higher metal concentrations. The seafloor at this time late in the deposition of the Second White Specks remained fairly inhospitable to organisms, although minor bioturbation is present and extends up into the overlying shales within the southern core. Finally, as deposition of the overlying Carlile Formation occurred, the waters became slightly more oxygenated and starting returning to normal marine conditions.

The Second White Specks Formation in the Birch Mountains is different from that elsewhere within the study area. Unfortunately, there is no available core between township 97 and 71, to assess whether or not there is a gradual or sudden change in metal values and lithology within the Second White Specks Formation. The most notable characteristics of the Second White Specks Formation in the Birch Mountains includes: coarser lithology, abundance of bentonites, high total organic carbon content and elevated metal concentrations. This variation may be due to the Birch Mountain core being closer to the paleoshoreline, the great distance from other core within this study and possibly restricted conditions in the Birch Mountains that favoured metal enrichment. This locale may represent a metalliferous mineral deposit that is not economic, but with the metal concentrations occurring from hydrothermal fluids. An alternative possibility is that the environment of deposition preserved abundant organic matter and metals in the dark grey shales by direct precipitation from sea water. No bioturbation was observed within the core, indicating that the bottom waters were fairly anoxic and inhospitable to organisms in the Second White Specks Formation deposited in the Birch Mountains.

To conclude, the Second White Specks Formation is a great source rock for organic carbon as demonstrated from previous studies, and by the high organic carbon contents found within this study. The highest organic carbon content is in the Birch Mountains and eastern Alberta where the formation is immature. The Second White Specks Formation is often used only as a marker horizon on geophysical logs, but its importance throughout Alberta as a source rock for hydrocarbons, and as a potential reservoir rock for oil or gas and host rock metalliferous shale, makes it a unique unit within the Cretaceous strata of the Western Interior Seaway.

# 6.0 APPENDICES

## 6.1 Logging Forms and Extra Logged Core Descriptions



### Legend

#### Rock Types and Thin Beds

| Rock Type | Rock Type |
|---|---|
| Anhydrite - primary | Igneous - basic |
| Anhydrite - secondary | Igneous - metamorphic |
| Argillite | Limestone - grain supported |
| Barite | Limestone - mud supported |
| Bentonite | Manganese |
| Breccia | Marlstone - calcareous |
| Calcareous | Marlstone - dolomitic |
| Cement | Mudstone |
| Conglomerate - mixed | Paleosol |
| Conglomerate - dark chert | Phosphate |
| Conglomerate - light chert | Pyrite |
| Conglomerate - varicolored chert | Quartz |
| Chert - dark | Salt |
| Chert - fossiliferous | Shale - black |
| Chert - light | Shale - dark gray |
| Chert - tripolitic | Shale - medium gray |
| Chert - varicolored | Shale - light gray |
| Claystone - colored | Shale - brown |
| Claystone - gray | Shale - green |
| Coal | Shale - red |
| Dolomite | Siderite |
| Ferruginous | Sandstone |
| Feldspar | Siltstone |
| Gypsum | Till - glacial |
| Igneous - acidic | Volcanic (Tuff) |
| | Welded Volcanic (Tuff) |

#### Accessories

| | | | |
|---|---|---|---|
| Anhydritic | Cherty - tripolitic | Illitic | Salt casts |
| Argillaceous | Cherty - varicolored | Kaolinitic | Sandy |
| Baritic | Chloritic | Lithic Fragment | Sideritic |
| Bentonitic | Clayey | Marly - calcareous | Siliceous |
| Bituminous | Dolomitic | Marly - dolomitic | Silty |
| Calcareous | Ferruginous staining | Micromicaceous | Slickenside |
| Carbonaceous | Fractures | Mixed layer clayey | Stylolitic |
| Cherty - dark | Glauconitic | Montmorillonitic | Tuffaceous |
| Cherty - fossiliferous | Gypsiferous | Phosphate pellets | Zeolitic |
| Cherty - light | Gibbsitic | Pyritic | |

#### Miscellaneous Grains

| | | |
|---|---|---|
| Biotite | Mineral crystal | Orthoclase |
| Glauconite | Mineral - dark | Plagioclase |
| Mica flakes | Muscovite | Sand grain |

#### Matrix

| | |
|---|---|
| Argillaceous | Marl - dolomitic |
| Bentonite | Micrite |
| Bituminous | Mixed Clay |
| Clay | Montmorillonite |
| Chlorite | Sand |
| Gibbsite | Silt |
| Illite | Sparry Calcite |
| Kaolinite | Zeolite |
| Marl - calcareous | |

#### Cement

| | |
|---|---|
| Anhydritic | Gypsiferous |
| Baritic | Hematitic |
| Bituminous | Limonitic |
| Calcareous | Pyritic |
| Chert - dark | Salt |
| Chert - light | Sideritic |
| Dolomitic | Siliceous |
| Ferruginous | |

#### Rounding Track

| | | | |
|---|---|---|---|
| vA | Very Angular | r | Subrounded |
| A | Angular | R | Rounded |
| a | Subangular | wR | Well Rounded |

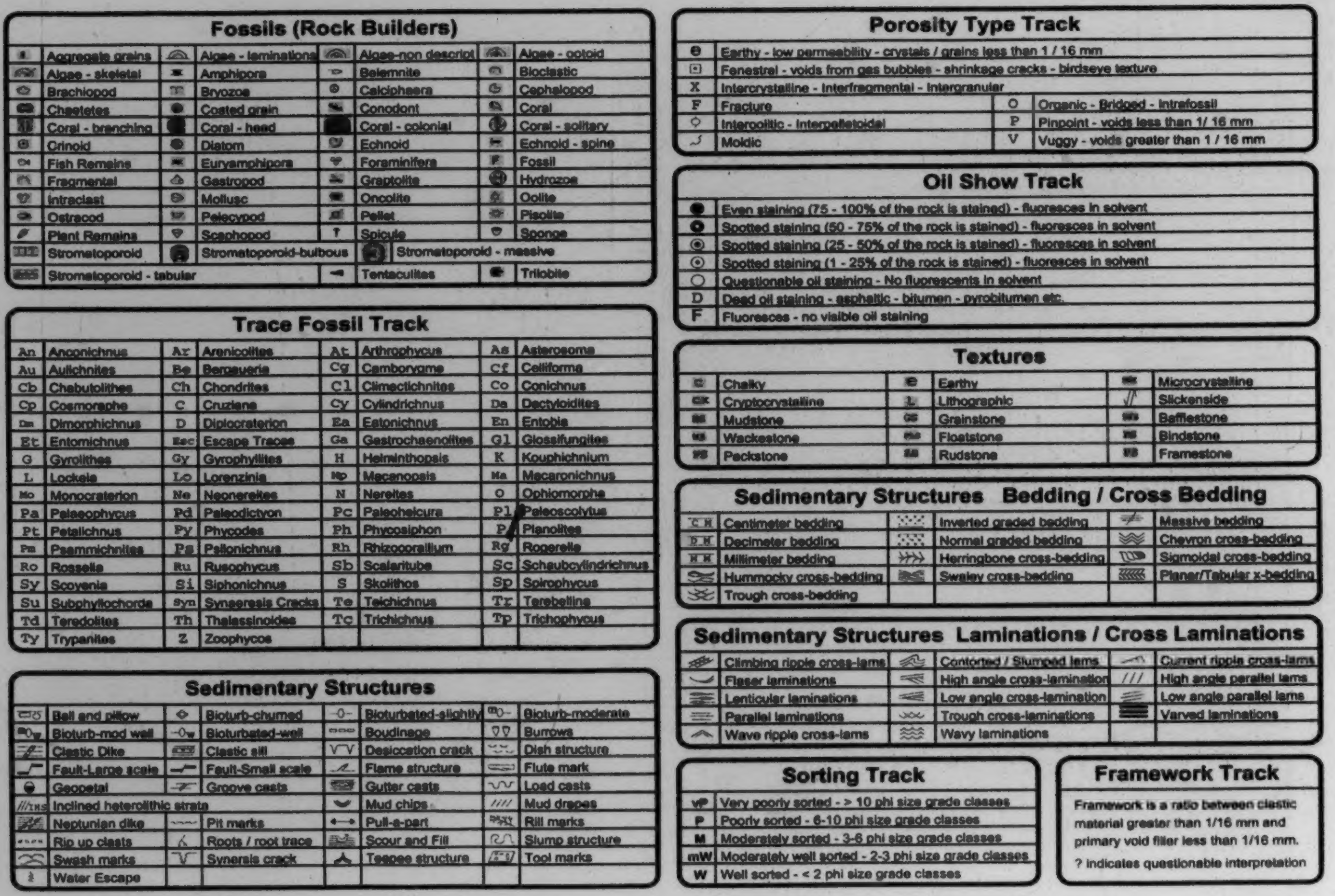
#### Core Track

Indicates Cored Interval

Indicates Lost Core

#### Test Track

Indicates Tested Interval



## Fossils (Rock Builders)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Aggregate grains | | Algae - laminations | | Algae-non descript | | Algae - ootoid |
| | Algae - skeletal | | Amphipora | | Belemnite | | Bioclastic |
| | Brachiopod | | Bryozoa | | Calcipheera | | Cephalopod |
| | Chaetetes | | Coated grain | | Conodont | | Coral |
| | Coral - branching | | Coral - head | | Coral - colonial | | Coral - solitary |
| | Crinoid | | Diatom | | Echnoid | | Echnoid - spine |
| | Fish Remains | | Euryamphipora | | Foraminifera | | Fossil |
| | Fragmental | | Gastropod | | Graptolite | | Hydrozoa |
| | Intraclast | | Mollusc | | Oncolite | | Oolite |
| | Ostracod | | Pelecypod | | Pellet | | Pisolite |
| | Plant Remains | | Scaphopod | | Spicule | | Sponge |
| | Stromatoporoid | | Stromatoporoid-bulbous | | Stromatoporoid - massive | | |
| | Stromatoporoid - tabular | | | | Tentaculites | | Trilobite |

## Trace Fossil Track

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| An | Anconichnus | Ar | Arenicolites | At | Arthrophycus | As | Asterosoma |
| Au | Aulichnites | Be | Bergaueria | Cg | Camborygma | Cf | Celliforma |
| Cb | Chabutolithes | Ch | Chondrites | Cl | Climactichnites | Co | Conichnus |
| Cp | Cosmoraphe | C | Cruziana | Cy | Cylindrichnus | Da | Dactyloidites |
| Dm | Dimorphichnus | D | Diplocraterion | Ea | Eatonichnus | En | Entobia |
| Et | Entomichnus | Esc | Escape Traces | Ga | Gastrochaenolites | Gl | Glossifungites |
| G | Gyrolithes | Gy | Gyrophyllites | H | Helminthopsis | K | Kouphichnium |
| L | Lockeia | Lo | Lorenzinia | Mp | Macanopsis | Ma | Macaronichnus |
| Mo | Monocraterion | Ne | Neonereites | N | Nereites | O | Ophiomorpha |
| Pa | Palaeophycus | Pd | Paleodictyon | Pc | Paleohelcura | Pl | Paleoscolytus |
| Pt | Petalichnus | Py | Phycodes | Ph | Phycosiphon | P | Planolites |
| Pm | Psammichnites | Ps | Psilonichnus | Rh | Rhizocorallium | Rg | Rogerella |
| Ro | Rosselia | Ru | Rusophycus | Sb | Scalaritube | Sc | Schaubcylindrichnus |
| Sy | Scoyenia | Si | Siphonichnus | S | Skolithos | Sp | Spirophycus |
| Su | Subphyllochorda | Syn | Synaeresis Cracks | Te | Teichichnus | Tr | Terebellina |
| Td | Teredolites | Th | Thalassinoides | Tc | Trichichnus | Tp | Trichophycus |
| Ty | Trypanites | Z | Zoophycos | | | | |

## Sedimentary Structures

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ball and pillow | | Bioturb-churned | | Bioturbated-slightly | | Bioturb-moderate |
| | Bioturb-mod well | | Bioturbated-well | | Boudinage | | Burrows |
| | Clastic Dike | | Clastic sill | | Desiccation crack | | Dish structure |
| | Fault-Large scale | | Fault-Small scale | | Flame structure | | Flute mark |
| | Geopetal | | Groove casts | | Gutter casts | | Load casts |
| ///IHS | Inclined heterolithic strata | | | | Mud chips | //// | Mud drapes |
| | Neptunian dike | | Pit marks | | Pull-a-part | | Rill marks |
| | Rip up clasts | | Roots / root trace | | Scour and Fill | | Slump structure |
| | Swash marks | | Synersis crack | | Teepee structure | | Tool marks |
| | Water Escape | | | | | | |

## Porosity Type Track

| | | | |
|---|---|---|---|
| ⊖ | Earthy - low permeability - crystals / grains less than 1 / 16 mm | | |
| ⊡ | Fenestral - voids from gas bubbles - shrinkage cracks - birdseye texture | | |
| X | Intercrystalline - Interfragmental - Intergranular | | |
| F | Fracture | O | Organic - Bridged - Intrafossil |
| | Interoolitic - Interpelletoidal | P | Pinpoint - voids less than 1/ 16 mm |
| | Moldic | V | Vuggy - voids greater than 1 / 16 mm |

## Oil Show Track

| | |
|---|---|
| ● | Even staining (75 - 100% of the rock is stained) - fluoresces in solvent |
| ◉ | Spotted staining (50 - 75% of the rock is stained) - fluoresces in solvent |
| ◉ | Spotted staining (25 - 50% of the rock is stained) - fluoresces in solvent |
| ⊙ | Spotted staining (1 - 25% of the rock is stained) - fluoresces in solvent |
| ○ | Questionable oil staining - No fluorescents in solvent |
| D | Dead oil staining - asphaltic - bitumen - pyrobitumen etc. |
| F | Fluoresces - no visible oil staining |

## Textures

| | | | | | |
|---|---|---|---|---|---|
| | Chalky | | Earthy | | Microcrystalline |
| | Cryptocrystalline | | Lithographic | | Slickenside |
| | Mudstone | | Grainstone | | Bafflestone |
| | Wackestone | | Floatstone | | Bindstone |
| | Packstone | | Rudstone | | Framestone |

## Sedimentary Structures Bedding / Cross Bedding

| | | | | | |
|---|---|---|---|---|---|
| C M | Centimeter bedding | | Inverted graded bedding | | Massive bedding |
| D M | Decimeter bedding | | Normal graded bedding | | Chevron cross-bedding |
| M M | Millimeter bedding | | Herringbone cross-bedding | | Sigmoidal cross-bedding |
| | Hummocky cross-bedding | | Swaley cross-bedding | | Planer/Tabular x-bedding |
| | Trough cross-bedding | | | | |

## Sedimentary Structures Laminations / Cross Laminations

| | | | | | |
|---|---|---|---|---|---|
| | Climbing ripple cross-lams | | Contorted / Slumped lams | | Current ripple cross-lams |
| | Flaser laminations | | High angle cross-lamination | /// | High angle parallel lams |
| | Lenticular laminations | | Low angle cross-lamination | | Low angle parallel lams |
| | Parallel laminations | | Trough cross-laminations | | Varved laminations |
| | Wave ripple cross-lams | | Wavy laminations | | |

## Sorting Track

| | |
|---|---|
| vP | Very poorly sorted - > 10 phi size grade classes |
| P | Poorly sorted - 6-10 phi size grade classes |
| M | Moderately sorted - 3-6 phi size grade classes |
| mW | Moderately well sorted - 2-3 phi size grade classes |
| W | Well sorted - < 2 phi size grade classes |

## Framework Track

Framework is a ratio between clastic material greater than 1/16 mm and primary void filler less than 1/16 mm.

? indicates questionable interpretation

## Well Information

**Operator:**
**Well Name:** 7BK03
**Location:**
**UWI:** 100020310112W400
**Pool:**
**Field:**
**Province / State:**
**Country:**

## Elevations

**Reference:**
**Ground:** m
**Cut(-) / Fill(+):**
**Kelly Bushing:** m
**K.B. to Ground:** m
**Casing Flange:** m

## Surface Co - Ordinates

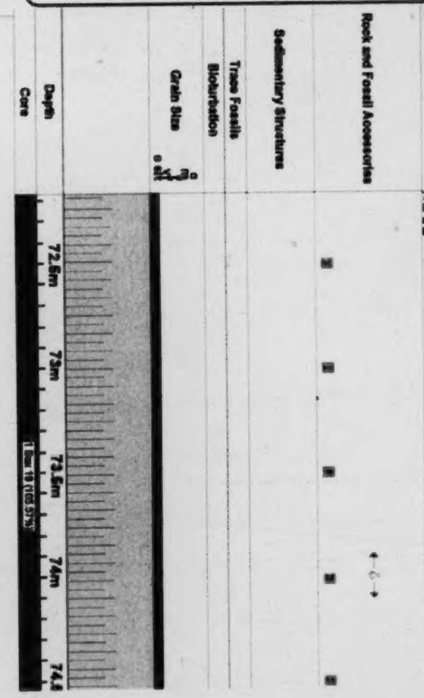
**Well Type:** Straight
**Longitude:**
**Latitude:**
**N / S Co - Ordinates:** 6398930
**E / W Co - Ordinates:** 447770

## Bottom Hole Co - Ordinates

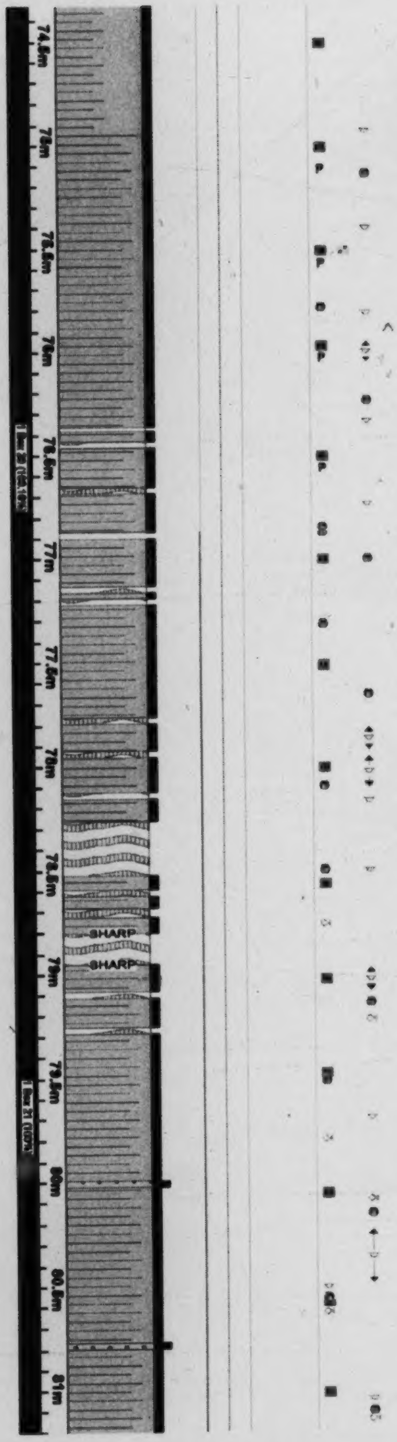
**Longitude:**
**Latitude:**
**N / S Co - Ordinates:**
**E / W Co - Ordinates:**

## Well Summary

**Spud Date:**
**Contractor:** Elgin Exploration Company
**TD Date:**
**Rig Release Date:**


Core
Depth
Grain Size
Bioturbation
Trace Fossils
Sedimentary Structures
Rock and Fossil Accessories
72.5m
73m
73.5m
74m
74.5
1 Bx 19 (103.51%)

| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 72.17 - 74.966m : No reaction to HCl, medium milky gray, low amount of silt - clay rich, some brown staining, silty lenses/farms | | |
| | | 72.43 - 72.53m : 8088 |
| | | 73.42 - 73.53m : 8089 |
| | 74m : Fish fragments | |
| | | 74.41 - 74.51m : 8090 |



75.03m : Contact between the overlying Labiche Shale and the underlying Second White Specks Formation

74.955 - 78.15m : Low to no reaction with HCl, silty shale, some shelly fragments, micas, pyrite rich in areas

77m : Reaction with HCl increasing down section

78.15 - 81.69m : Generally strong reaction with HCl, silty, mica rich, shelly debris, fish remains, some sand

80m Shale: Very fine sandy pockets, fish fragments, shelly debris

74.875m : Start of the Second White Specks Formation, abrupt change to dk gray shale, slightly calcareous

75.5 - 75.52m : White concretionary layer? Very fine sand pockets

75.675m : Concretionary layer? Silicified? Brown colouring

75.955 - 76.055m : Rubbly shale - white clasts - shells?

76.36 - 77.16m : Multiple very thin (mm thick) bentonites

77.19m : Mm thick bentonite

77.39 - 77.49m : Black layers and some brown staining

77.76 - 78.15m : At least 3 blue/grey bentonites, brown discolouration and shelly/calcareous layers

78.26 - 78.52m : Thick blue bentonite

78.52 - 78.8m Shale: Dk grey shale with thin bentonite(s) and brown colouring

78.8 - 78.95m : Blue bentonite

79m : A few sections of reworked bentonites and shells

79.58 - 79.76m : Rubbly looking shale

80.34m : Shelly debris layer

74.41 - 74.51m : 8090

75.56 - 75.66m : 8091

76.44 - 76.53m : 8093

77.34 - 77.43m : 8094

77.9 - 77.99m : 8095

78.39 - 78.49m : 8119

78.53 - 78.66m : 8120

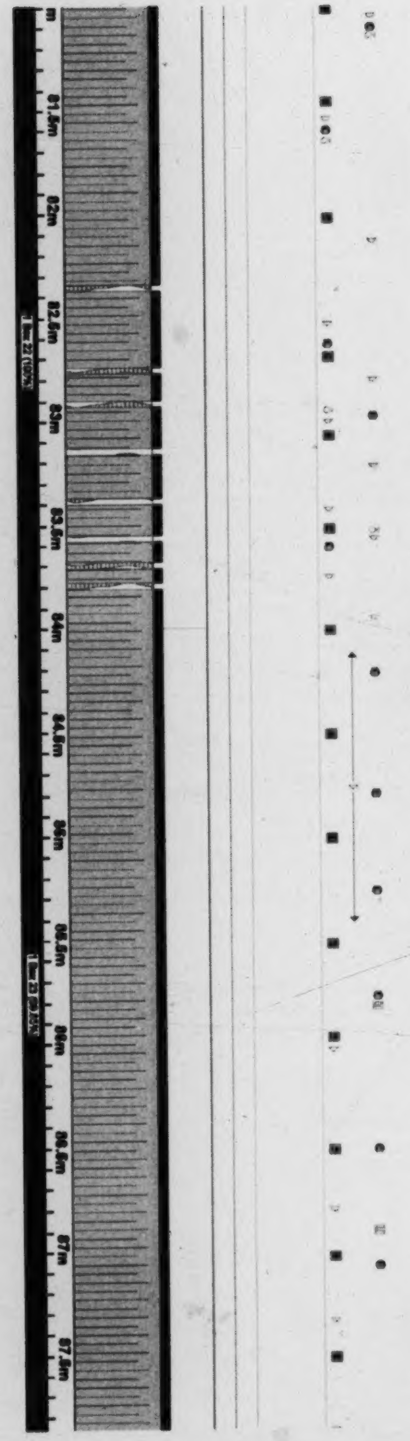
78.69 - 78.71m : 8082

78.82 - 78.92m : 8121

79.4 - 79.53m : 8122

80.275 - 80.345m : 8124

80.4 - 80.51m : 8123



81.38 - 81.5m
8125

81.69 - 84.12m : Strong reaction with HCl, dk gray silty shale, shelly debris interdispersed, fish debris

82.34 - 82.35m Shale: 1 cm thick blue bentonite

82.35 - 82.48m :
8126

82.74 - 82.75m : 1 cm thick steel grey bentonite

82.74 - 83.4m : Multiple thin bentonites

83.15 - 83.24m :
8127

83.34 - 83.44m :
8128

83.545 - 83.546m Shale: 1 cm blue bentonite, brown colouring

83.675 - 83.695m : 2 cm thick blue bentonite, mica rich and brown colouration

83.775 - 83.825m 5 cm thick blue bentonite

83.775 - 83.825m :
8129

84.12 - 87.385m Shale: Strong reaction with HCl, dk gray silty shale, mica rich, very abundant shelly material

84.28 - 84.41m :
8130

84.52 - 84.72m : Shelly debris layers

84.52 - 84.72m :
8131

85.1 - 85.1m : Shelly debris layer

85.28 - 85.38m : Shelly debris layers

85.28 - 85.38m :
8132

85.44 - 85.51m :
8133

85.78 - 86.27m : Very silty, rubbly shale

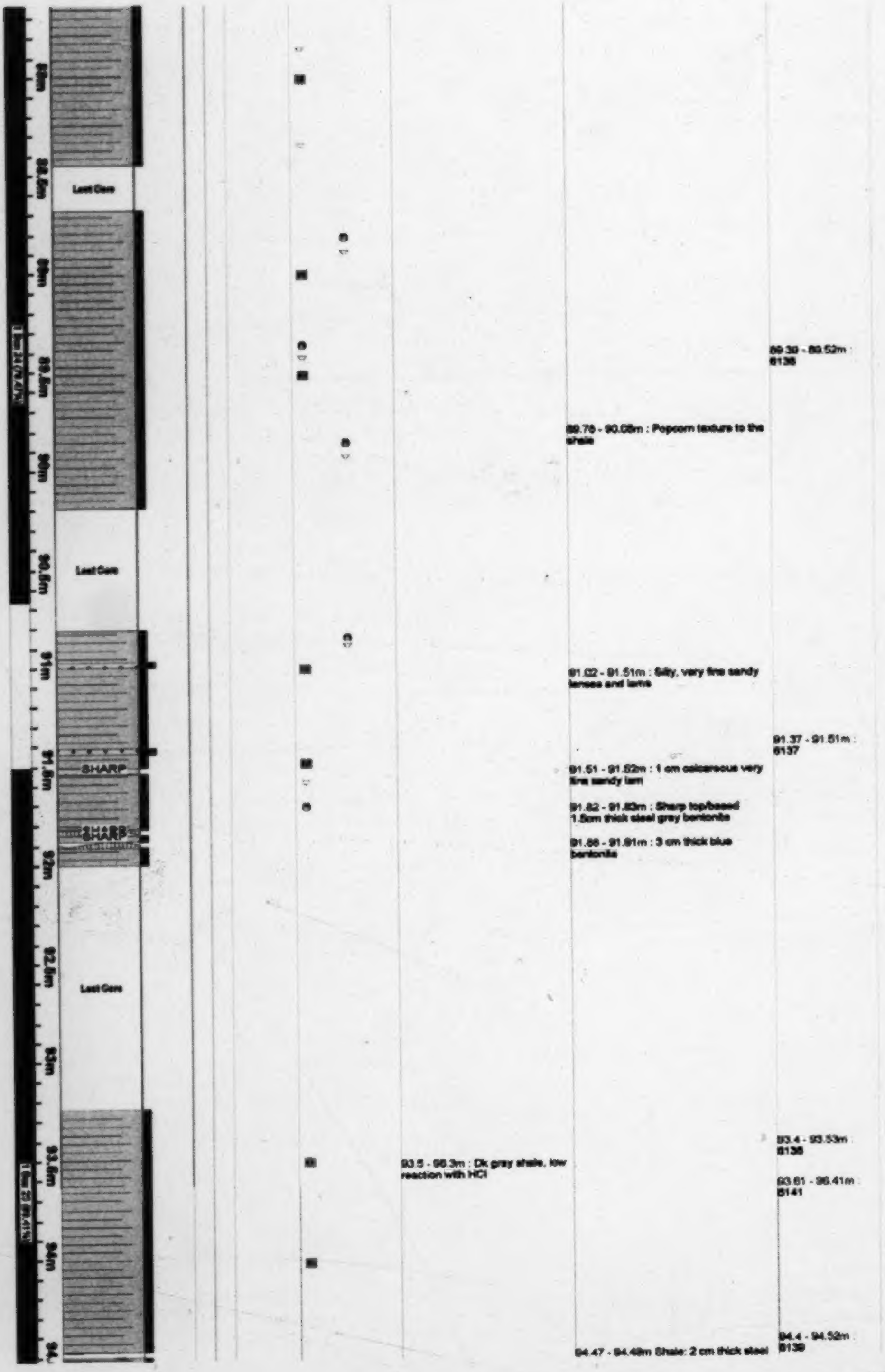
85.75m : Bentonite fragments

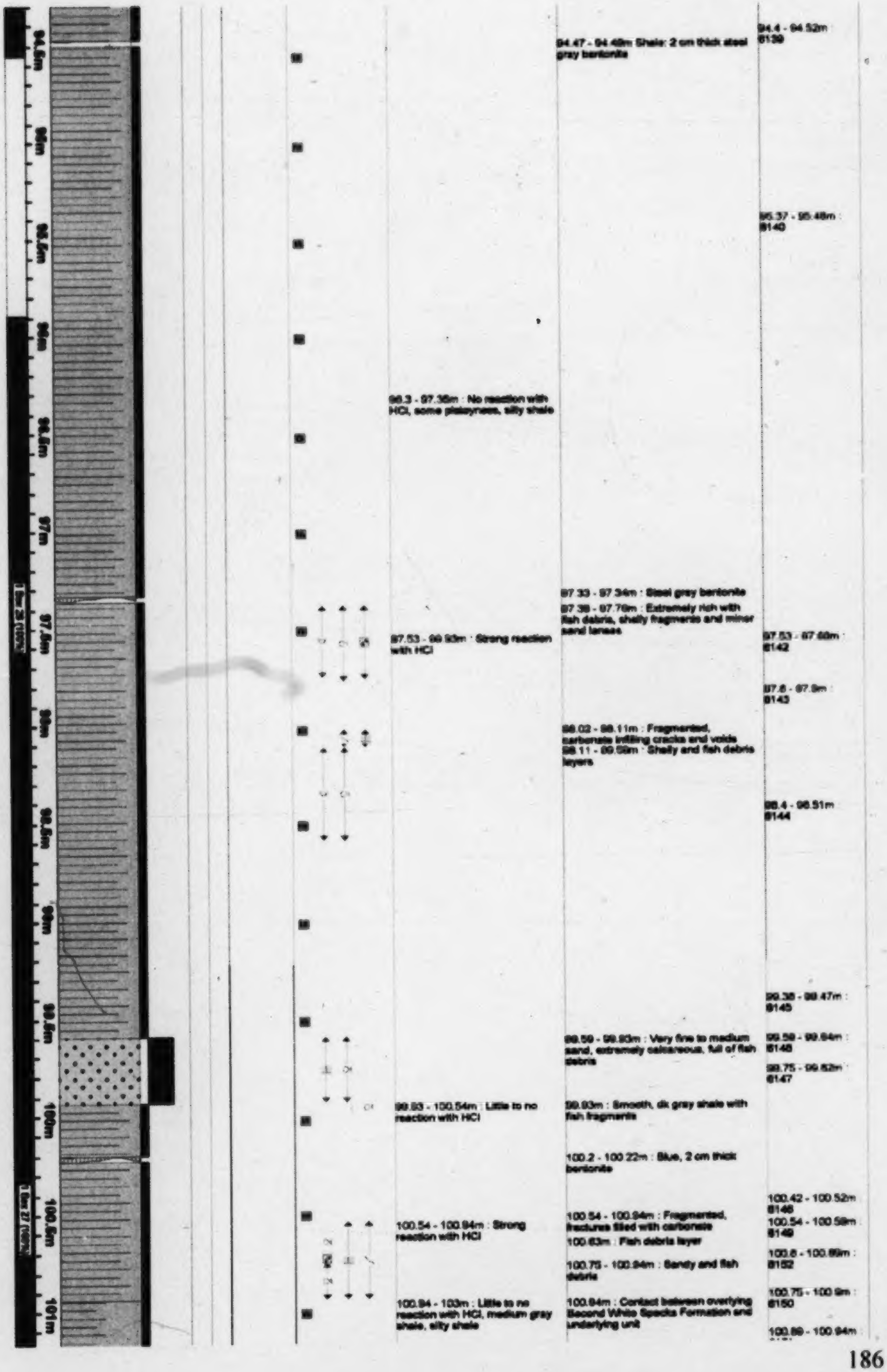
86.36 - 86.46m :
8134

86.8m : Bentonite fragments

87.385 - 92m : Strong reaction with HCl, silty, shelly rich/shelly debris, dk gray shale

87.385 - 87.545m :
8135


88m
88.5m
89m
89.5m
90m
90.5m
91m
91.5m
92m
92.5m
93m
93.5m
94m
Lost Core
Lost Core
Lost Core
SHARP
SHARP
SHARP
89.30 - 89.52m : B138
89.76 - 90.08m : Popcorn texture to the shale
91.02 - 91.51m : Silty, very fine sandy lenses and lams
91.37 - 91.51m : B137
91.51 - 91.52m : 1 cm calcareous very fine sandy lam
91.82 - 91.83m : Sharp top/based 1.5cm thick steel gray bentonite
91.88 - 91.91m : 3 cm thick blue bentonite
93.4 - 93.53m : B136
93.5 - 96.3m : Dk gray shale, low reaction with HCl
93.61 - 96.41m : B141
94.4 - 94.52m : B139
94.47 - 94.49m Shale: 2 cm thick steel



94.47 - 94.48m Shale: 2 cm thick steel gray bentonite

94.4 - 94.52m : B139

95.37 - 95.48m : B140

96.3 - 97.36m : No reaction with HCl, some platyness, silty shale

97.33 - 97.34m : Steel gray bentonite

97.36 - 97.76m : Extremely rich with fish debris, shelly fragments and minor sand lenses

97.53 - 99.93m : Strong reaction with HCl

97.53 - 97.60m : B142

97.8 - 97.9m : B143

98.02 - 98.11m : Fragmented, carbonate infilling cracks and voids
98.11 - 99.59m : Shelly and fish debris layers

98.4 - 98.51m : B144

99.38 - 99.47m : B145

99.59 - 99.93m : Very fine to medium sand, extremely calcareous, full of fish debris

99.59 - 99.64m : B146

99.75 - 99.82m : B147

99.93 - 100.54m : Little to no reaction with HCl

99.93m : Smooth, dk gray shale with fish fragments

100.2 - 100.22m : Blue, 2 cm thick bentonite

100.42 - 100.52m B148

100.54 - 100.94m : Strong reaction with HCl

100.54 - 100.94m : Fragmented, fractures filled with carbonate

100.54 - 100.59m : B149

100.63m : Fish debris layer

100.6 - 100.69m : B152

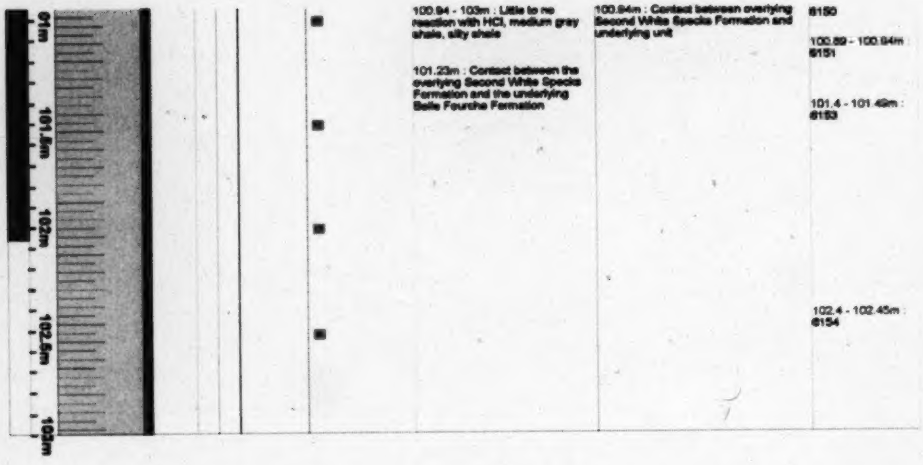
100.75 - 100.94m : Sandy and fish debris

100.75 - 100.9m : B150

100.94 - 103m : Little to no reaction with HCl, medium gray shale, silty shale

100.94m : Contact between overlying Second White Specks Formation and underlying unit

100.89 - 100.94m :



100.94 - 103m : Little to no reaction with HCl, medium grey shale, silty shale

101.23m : Contact between the overlying Second White Specks Formation and the underlying Belle Fourche Formation

100.94m : Contact between overlying Second White Specks Formation and underlying unit

@150

100.89 - 100.94m : @151

101.4 - 101.49m : @153

102.4 - 102.45m : @154

**Well Information**

**Operator:** Apache Canada Ltd.
**Well Name:** ACL Snipelk 4-2-71-18
**Location:**
**UWI:** 100040207118W500
**Pool:** Beaverhill Lake (744000)
**Field:** Snipe Lake (856)
**Province / State:** Alberta
**Country:** Canada

**Elevations**

**Reference:**
**Cut(-) / Fill(+):**
**K.B. to Ground:** m
**Ground:** 794.3 m
**Kelly Bushing:** 798.6 m
**Casing Flange:** m

**Surface Co - Ordinates**

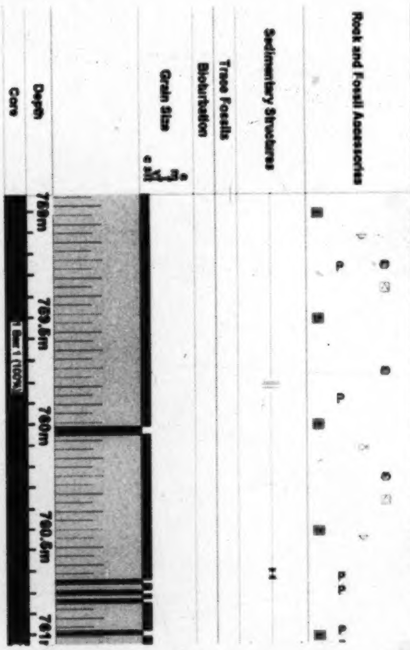
**Well Type:** Straight
**Longitude:** -116.663060
**Latitude:** 55.114423
**N / S Co - Ordinates:** 200.9
**E / W Co - Ordinates:** 201.7

**Bottom Hole Co - Ordinates**

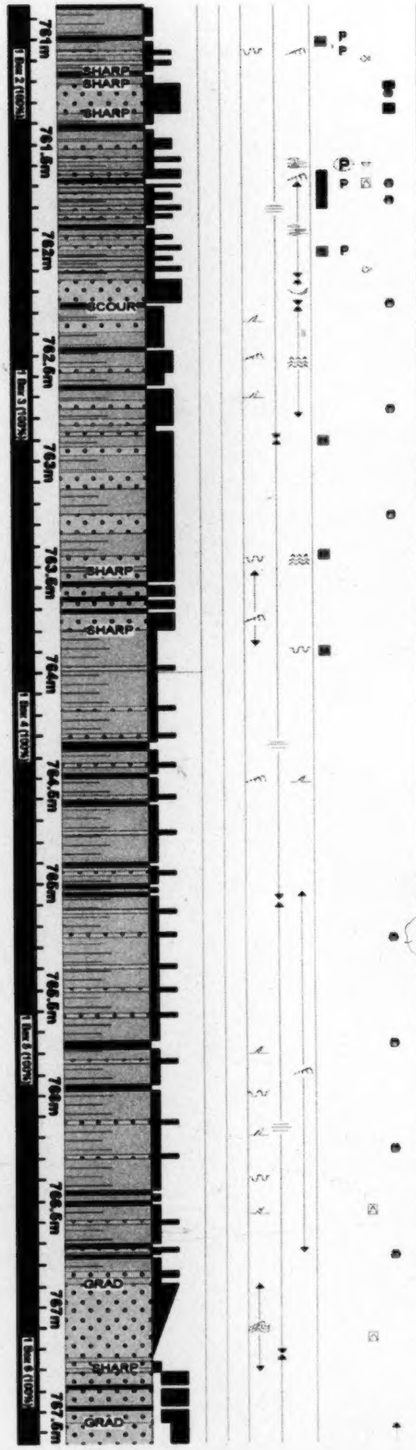
**Longitude:** -116.663060
**Latitude:** 55.114423
**N / S Co - Ordinates:** 200.9
**E / W Co - Ordinates:** 201.7

**Well Summary**

**Spud Date:** Jan 17, 1964
**Contractor:**
**TD Date:**
**Rig Release Date:** Feb 17, 1964



| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 758.92 - 760.44m : Med grey shale, silty clay, discontinuous and continuous silt lams, no reaction with HCl, mica rich, soft, quartz grains, disseminated pyrite <0.5% and concentrations, shells, fish debris | | 759.38 - 759.45m : 406 |
| | 759.9m. Concentrations of pyrite | |
| | 760.01 - 760.045m: Wedge shaped red/orange coloured siderite, sharp based | 759.99 - 760.06m : 407 |
| | Wisps of very fine pyrite - concentrated in discontinuous silty lams | 760.38 - 760.44m : 408 |
| 760.44 - 761.97m : No reaction with HCl, mica rich, disseminated pyrite up to 2% in areas, fish debris, black organics, shells, some sand, abundant siderite | Discontinuous lams<br>760.73m : Pyrite nodule<br>760.74m : Siderite nodule with a brown browniried halo and surrounding pyrite<br>760.79m : Siderite nodule with pyrite<br>760.96m : Siderite with concentrated pyrite<br>761.06m : Fine sand, very sharp based, quartz rich, pyrite lams and lenses within sand, some ripples, some | |



762.14 - 762.27m : Flaser bedding, siderite at the base - sharp based, medium sand

762.97 - 763.49m : No reaction with HCl, mica rich, micas and black organics on broken surfaces

763.49 - 765.02m : No reaction with HCl, quartz grains, fissile shale, 50% very fine sand, sharp based, 50% silty shale, siderite

765.02 - 766.54m : No reaction with HCl, 80% shale, 20% very fine sand, mica rich, percentage of sand decreasing downhole, distinction between sand and shale becoming less distinct, abundant siderite

766.54 - 768.07m : No reaction with HCl, fine to very fine sharp based sand lams, abundant siderite-gradational, breaking blocky, quartz grains

767.55 - 769.59m : Medium to upper sand, beige in colour - salt

pyrite

761.05m : Fine sand, very sharp based, quartz rich, pyrite lams and lenses within sand, some ripples, some loading

761.21 - 761.33m : Medium sand with a few shale lams, orange/red siderite grains, loading, sharp top and base

761.48 - 761.52m : Fine sand with black organics, siderite grains

761.54 - 761.64m : Shale with fine sand lams - lenticular bedding, medium sand lenses and pyrite nodules

761.64 - 761.68m : Fine sand, ripples with cross lams, siderite at the base, thin lams of coal? - black and vitreous

761.685 - 761.695m : Medium sand lense, pyrite, quartz, micas

761.68 - 762.14m : Lenticular bedding, 10-20% fine sand, lenses of medium sand, dominantly shale, pyrite grains <1%, abundant lams of siderite

762.14 - 762.27m : Flaser bedding, siderite at the base - sharp based, medium sand

762.27 - 762.8m : 30% sand, 70% shale, wavy bedding, soft sed deformation - flame structures, sand is fine grained and sharp based, cross lams, sand % increasing downhole

762.69 - 762.74m : Sand from very fine at the top to fine at the base

762.8 - 762.88m : Fine sand with sharp base

762.88 - 763.42m : Laminations of sand and shale, sand is sharp based, silt lams

763.42 - 763.52m : 50% shale, 50% sand, sands pinching out, sharp based, convoluted, wavy bedding, loading

763.52m : Sharp contact between overlying sand and shale and underlying sand

763.52 - 763.88m : Sand with sharp top and basal contacts, low angle cross lams, red lams of siderite grains

763.88m : Dominated by silty shale downhole, sharp based sands, loading, abundant siderite

763.88m : Sharp contact between overlying sands and underlying shales, siderite base

764.5m : Sand lams, low angle cross lams, sand and shale beds up to a couple of cms in thickness, most contacts are undulatory with loading, flame structures

765.04 - 765.745m : 80% shale, 20% very fine sand, bedding, cross lams, wavy-sharp base, grading from shale up into sands

765.78 - 766.54m : Shale with very fine sand lams, abundance of sand is decreasing downwards, loading, flame structures, abundant siderite in lams, mottled

766.8m : Medium sand lams, abundant micas, siderite

766.89m : Gradational contact between overlying shale and sand and underlying sands

766.89 - 767.31m : Fine sand with shale lams, breaking blocky, convoluted bedding, loading, shale at the base

767.31 - 767.55m : Sharp top, gradational base, upper fine sand to medium sand with black organic lams and siderite grains forming lams

767.55 - 767.9m : A few organic rich

761.255 - 761.305m : 409

761.37 - 761.38m : 410

761.42 - 761.45m : 411

761.465 - 761.52m : 412

762.22 - 762.275m : 413

762.35 - 762.39m : 414

763.43 - 763.46m : 415

764.33 - 764.35m : 417

764.465 - 764.52m : 418

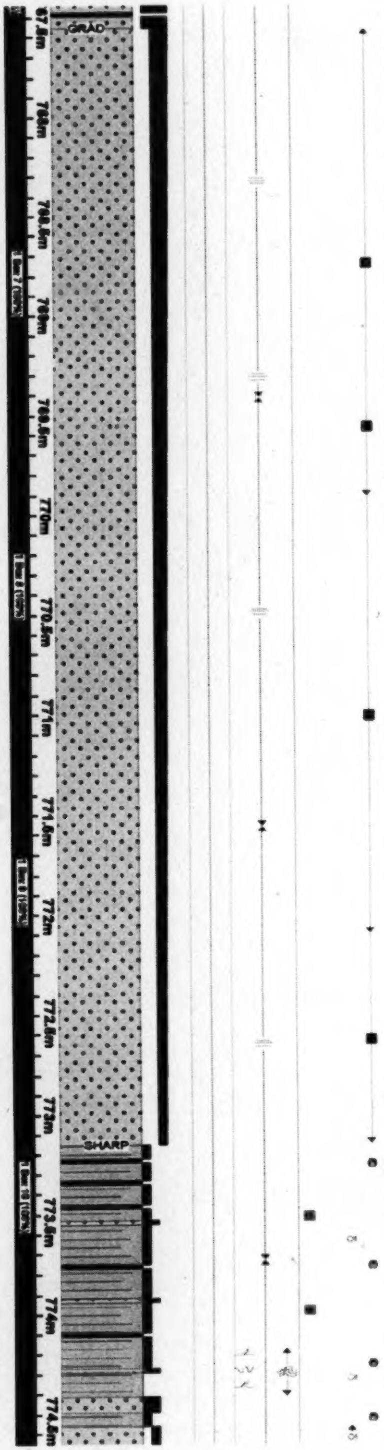
765.02 - 765.065m : 419

765.445 - 765.495m : 420

766.45 - 766.52m : 421

767.44 - 767.48m : 422

767.56 - 767.61m :



767.55 - 769.59m : Medium to upper sand, beige in colour - salt and pepper, disseminated grains of siderite, with some lams forming at the base

769.59 - 771.12m : Strong reaction with HCl, upper fine beige/grey sand, orange/red siderite grains

771.12 - 773.155m : Strong reaction with HCl, red/orange siderite grains, beige/grey and black coloured sands, medium to upper fine grained sand

773.155 - 774.17m : No reaction with HCl when dk grey shale becomes dominant, siderite, mica rich shale, dominantly clays with lams of silt and very fine sand, black organic matter, siderite

medium sand with black organic lams and siderite grains forming lams

767.55 - 767.9m : A few organic rich lams at the top, medium sized sands

767.9 - 769.59m : Gradational into upper fine grained sand, medium sand

768.07 - 768.07m : Strong reaction with HCl, upper fine sand, minor siderite grains

769.75 - 769.76m : Laminations of orange coloured siderite grains

769.96 - 770.02m : A few black organic lenses and orange/red siderite grains in lenses

772.64 - 772.77m : Minor orange/red siderite grains with black organic matter forming lams

772.9 - 773.155m : Upper fine grained sand

773.155m : Sharp contact with overlying sands and underlying shales

773.155m Shale: Mica rich lam

773.49 - 773.505m : Heavy brown/red lam

Fish debris

774.17 - 774.17m : Shales with black organic matter

774.17 - 774.41m : Shale with very fine sand lams, mottled, convoluted lams, flame structures, loading

774.41 - 774.49m : Very fine sand with shale, white specks at 774.435

774.49 - 774.56m : Shale

774.56 - 774.66m : Fish debris, black

767.44 - 767.48m : 422

767.56 - 767.61m : 423

767.745 - 767.81m : 424

768.505 - 768.575m : 425

768.54 - 768.59m : 416

768.67 - 768.74m : 4517

769.445 - 769.505m : 426

770.49 - 770.55m : 427

771.12 - 771.2m : 428

771.52 - 771.58m : 429

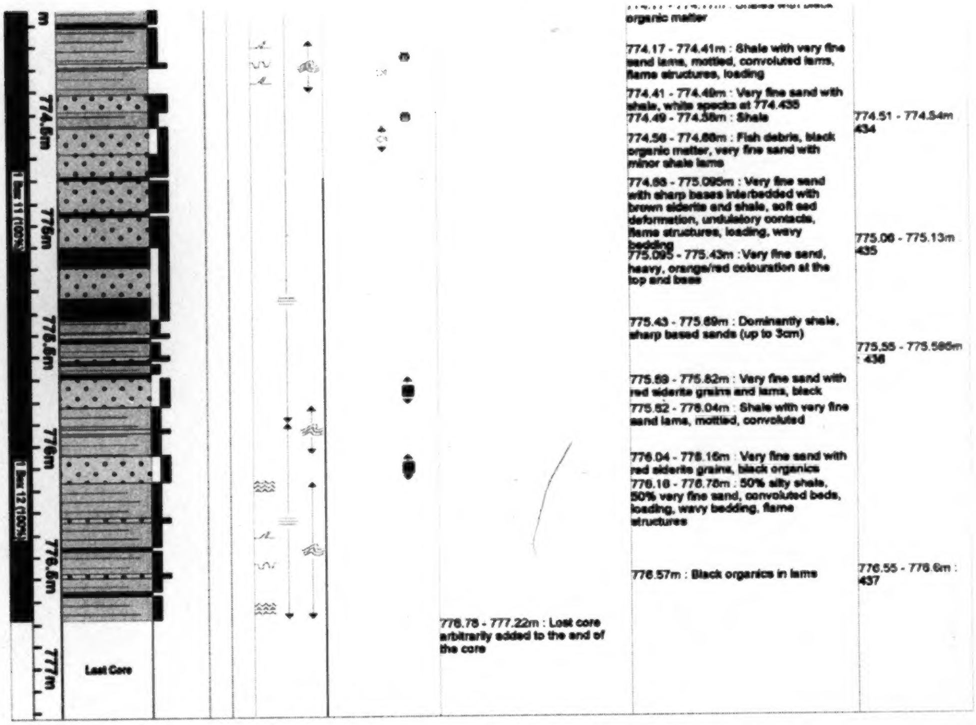
772.44 - 772.51m : 430

773.09 - 773.15m : 431

773.5 - 773.54m : 432

773.74 - 773.78m : 433

774.51 - 774.54m : 434


m
774.5m
775m
775.5m
776m
776.5m
777m
Box 11 (100%)
Box 12 (100%)
Lost Core
organic matter
774.17 - 774.41m : Shale with very fine sand lams, mottled, convoluted lams, flame structures, loading
774.41 - 774.49m : Very fine sand with shale, white specks at 774.435
774.49 - 774.56m : Shale
774.56 - 774.88m : Fish debris, black organic matter, very fine sand with minor shale lams
774.88 - 775.095m : Very fine sand with sharp bases interbedded with brown siderite and shale, soft sed deformation, undulatory contacts, flame structures, loading, wavy bedding
775.095 - 775.43m : Very fine sand, heavy, orange/red colouration at the top and base
775.43 - 775.69m : Dominantly shale, sharp based sands (up to 3cm)
775.69 - 775.82m : Very fine sand with red siderite grains and lams, black
775.82 - 776.04m : Shale with very fine sand lams, mottled, convoluted
776.04 - 776.16m : Very fine sand with red siderite grains, black organics
776.16 - 776.78m : 50% silty shale, 50% very fine sand, convoluted beds, loading, wavy bedding, flame structures
776.57m : Black organics in lams
776.78 - 777.22m : Lost core arbitrarily added to the end of the core
774.51 - 774.54m : 434
775.06 - 775.13m : 435
775.55 - 775.586m : 436
776.55 - 776.6m : 437

**00/04-02-071-18W5/0: ACL Snipelk 4-2-71-18**

*Core:* 758.92m – 776.78m

*Second White Specks interval from cross section:* 722m – 740m

*Observations:*

The core is dominated by beds of non-calcareous medium grey shale. Abundant siderite, fine-to-medium sand, disseminated pyrite, shell and fish debris are observed. There is abundant soft sediment deformation as well as ripples with cross laminations. There is a 6m interval which is dominated by sand, and no white specks are identified.

*Interpretations:*

The core is stratigraphically below the Second White Specks Formation and may represent the Belle Fourche Formation or another underlying unit. Sedimentologically, this core has much more sand than expected for the Second White Specks Formation, as well as abundant siderite.

**Well Information**

**Operator:** Conocophillips Canada Resources Corp.
**Well Name:** Wabamun No 1
**Location:**
**UWI:** 100051005104W500
**Pool:** Unknown
**Field:** Highvale (477)
**Province / State:** Alberta
**Country:** Canada

**Elevations**

| | | | |
|---|---|---|---|
| **Reference:** | | **Ground:** | 780.9 m |
| **Cut(-) / Fill(+):** | | **Kelly Bushing:** | 783.6 m |
| **K.B. to Ground:** | m | **Casing Flange:** | m |

**Surface Co - Ordinates**

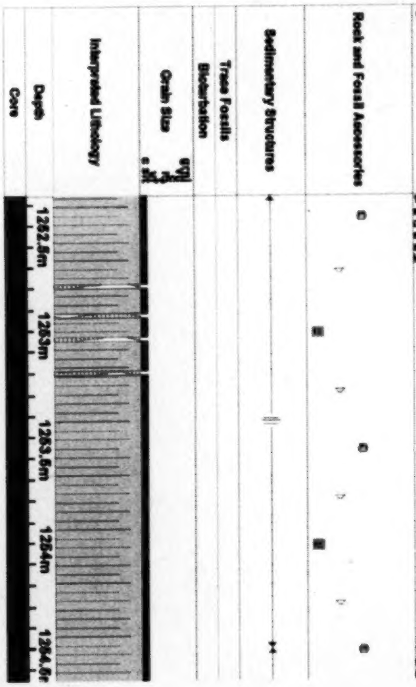
**Well Type:** Straight
**Longitude:** 114.514684
**Latitude:** 53.386385
**N / S Co - Ordinates:** 566.5
**E / W Co - Ordinates:** 101.4

**Bottom Hole Co - Ordinates**

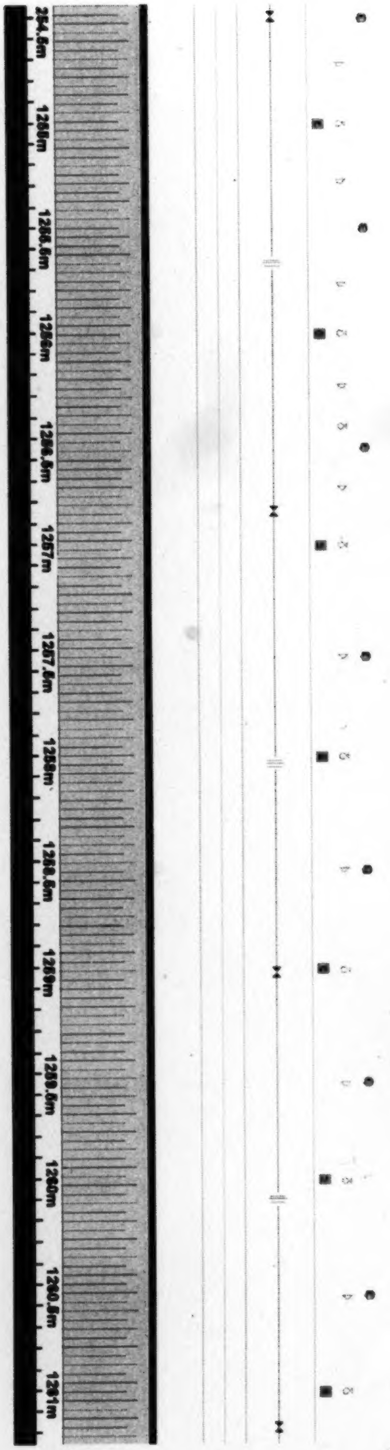
**Longitude:** 114.514684
**Latitude:** 53.386385
**N / S Co - Ordinates:** 566.5
**E / W Co - Ordinates:** 101.4

**Well Summary**

| | | | |
|---|---|---|---|
| **Spud Date:** | Aug 7, 1947 | **Contractor:** | |
| **TD Date:** | | **Rig Release Date:** | Feb 25, 1948 |


Core
Depth
Interpreted Lithology
Grain Size
Bioturbation
Trace Fossils
Sedimentary Structures
Rock and Fossil Accessories
1252.5m
1253m
1253.5m
1254m
1254.5m

| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 1252.36 - 1254.495m : Dk grey shale, clays with 5-10% silt, discontinuous silt lams, very strong reaction with HCl, abundant shells and shell imprints, mica rich | | 1252.5 - 1252.51m : 4543 |
| | 1252.6m : Very fine sand sized white specks | |
| | 1252.78 - 1253.21m : Multiple broken bentonites (unsure of number), steel grey, soft | |
| | | 1253.11 - 1253.12m : 4547 |
| | | 1253.44 - 1253.46m : 4545 |
| | | 1253.5 - 1253.5m : 4544 |
| 1254.495 - 1256.94m : Very strong reaction with HCl, abundant shells, fish fragments, | | 1254.49 - 1254.5m : 4546 |


254.5m
1255m
1255.5m
1256m
1256.5m
1257m
1257.5m
1258m
1258.5m
1259m
1259.5m
1260m
1260.5m
1261m

1254.495 - 1256.94m : Very strong reaction with HCl, abundant shells, fish fragments, abundant white specks on broken surfaces

1254.49 - 1254.5m : 4546

1255.5 - 1255.51m : 4548

1256.445 - 1256.555m : Fish debris in lams

1256.5 - 1256.51m : 4549
1256.56 - 1256.58m : 4550

1256.94 - 1259.26m : Moderate to strong reaction with HCl, some shells, fish fragments

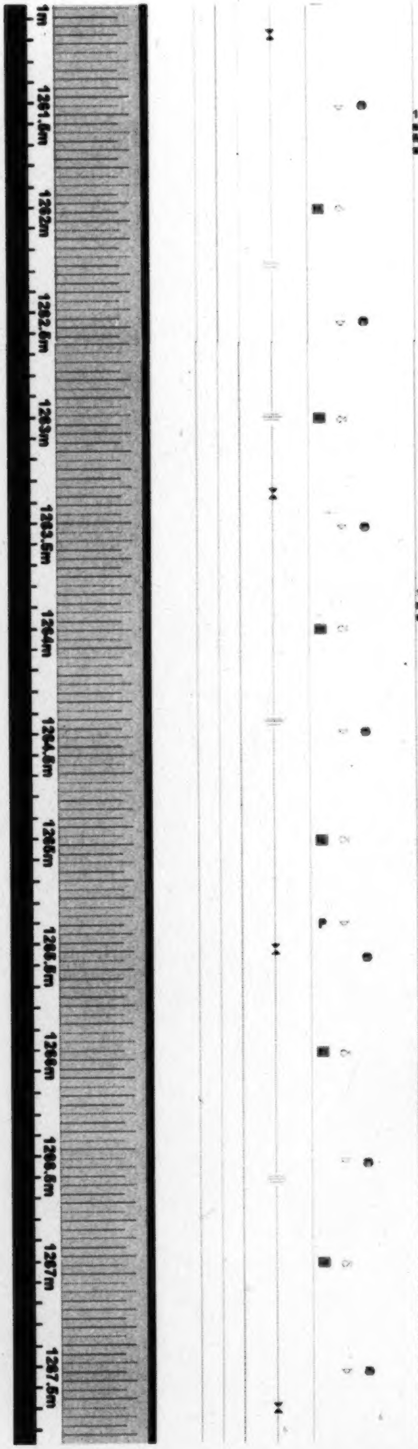
1257.5 - 1257.52m : 4551

1258.5 - 1258.51m : 4552

1259.26 - 1261.54m : Dk grey shale, moderate to strong reaction with HCl, discontinuous silty lams, white specks, abundant shell fragments, fish fragments

1259.5 - 1259.51m : 4553

1260.5 - 1260.52m : 4554


1m
1261.5m
1262m
1262.5m
1263m
1263.5m
1264m
1264.5m
1265m
1265.5m
1266m
1266.5m
1267m
1267.5m
P

1261.54 - 1263.82m : Dk grey shale, strong reaction with HCl, fish fragments, some shells and shelly debris

1261.51 - 1261.52m : 4555

1262.5 - 1262.51m : 4556

1263.54 - 1263.55m : 4557

1263.82 - 1266.08m : Moderate reaction with HCl, fish fragments, some shells

1264.5 - 1254.51m : 4558

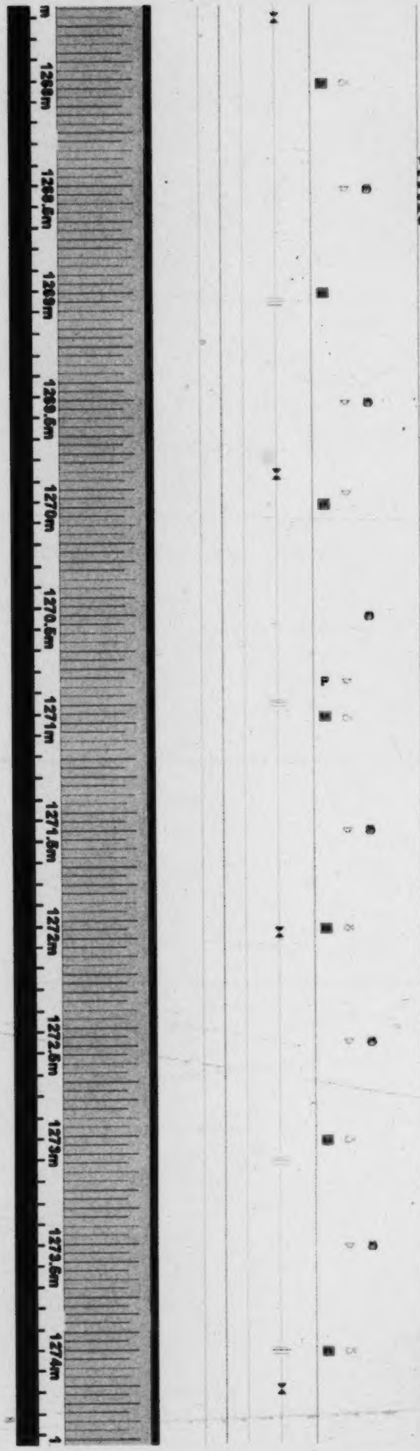
1265.4m : Pyritized shell

1265.5 - 1265.51m : 4559

1266.08 - 1268.36m : Moderate to weak reaction with HCl, discontinuous lams of silt, silt <5%, shell fragments, a few fish fragments, white specks are seen

1266.5 - 1266.51m : 4560

1267.5 - 1267.51m : 4561


m
1268m
1268.5m
1269m
1269.5m
1270m
1270.5m
1271m
1271.5m
1272m
1272.5m
1273m
1273.5m
1274m
P

1268.38 - 1270.84m : Strong reaction with HCl, some shells and shell imprints, mica rich, clays with discontinuous silt lams, white specks are visible (very fine sand sized)

1269.95 - 1269.955m : 0.5 cm thick shell

1270.84 - 1272.92m : Strong reaction with HCl, some shells, dk grey shale, fish fragments

1270.84m : Pyritized shell

1273.92 - 1275.2m Shale: Strong reaction with HCl, fine sand sized white specks, some concentrations of shells, abundant shells and shell imprints

1268.5 - 1268.51m : 4562

1269.5 - 1269.52m : 4563

1270.5 - 1270.52m : 4564

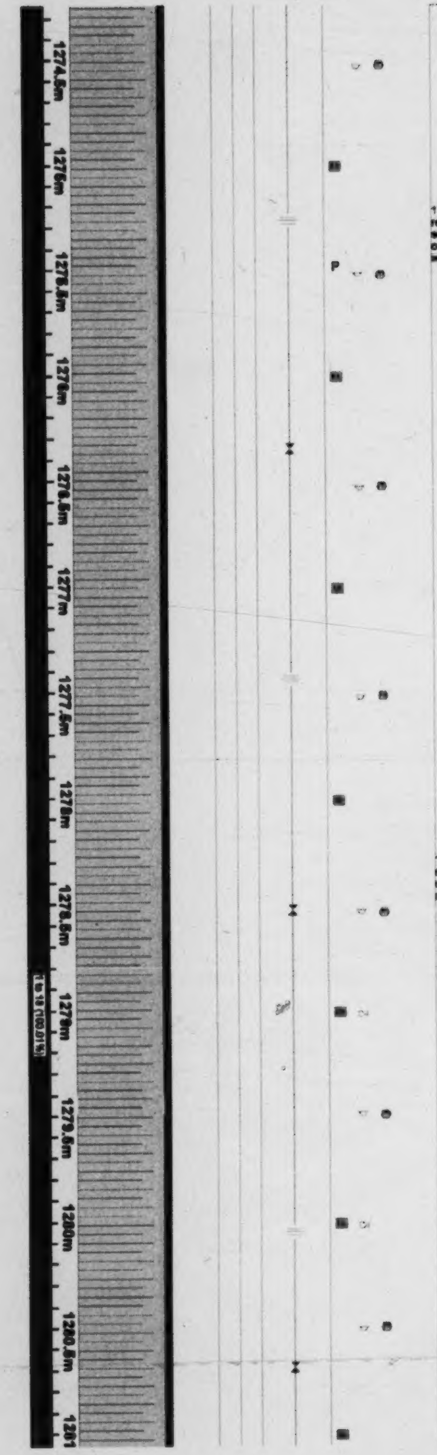
1271.5 - 1271.5m : 4565

1272.5 - 1272.51m : 4566

1272.69 - 1272.72m : 4567

1273.5 - 1273.51m : 4568

1274.5 - 1274.51m : 4569


1274.5m
1275m
1275.5m
1276m
1276.5m
1277m
1277.5m
1278m
1278.5m
1279m
1279.5m
1280m
1280.5m
1281
1 to 18 (103.01%)
P

1274.5 - 1274.51m : 4569

1274.54 - 1274.56m : 4570

1275m : Fine to medium sand sized white specks, disseminated and forming lams

1275.2 - 1276.27m : Very strong reaction with HCl, a few shells, some discontinuous, up to coarse sand sized abundant white specks

1275.16 - 1275.42m : 4571

1275.48 - 1275.48m : Pyrite lams

1275.5 - 1275.51m : 4572

1276.5 - 1276.51m : 4573

1277.5 - 1277.51m : 4574

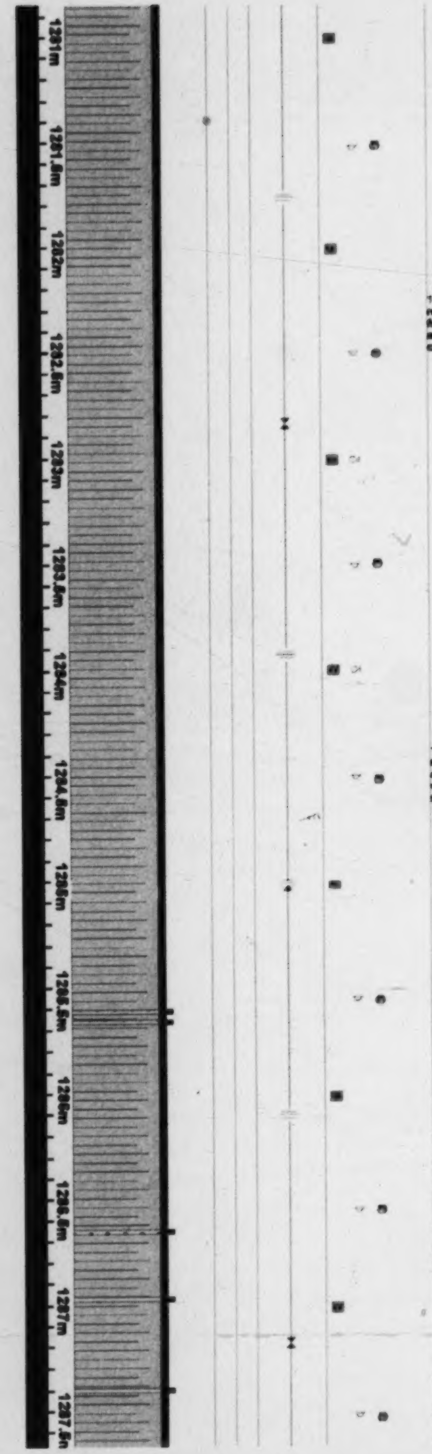
1278.27 - 1280.55m : Strong reaction with HCl, dk grey shale, minor fish fragments, some shells

1278.5 - 1278.51m : 4575

1279.5 - 1279.55m : 4576

1280.5 - 1280.51m : 4577

1280.55 - 1282.23m : Strong reaction with HCl, abundant white specks, some shells



1282.23 - 1284.36m : Weak reaction with HCl, shells fragments, a little fish debris, abundant white specks concentrated in areas

1284.36 - 1286.64m : Weak reaction with HCl, some shells, discontinuous silt lams, some very fine sandy lams, a few white specks

1286.64 - 1286.92m : Dk grey shale, moderate to weak reaction with HCl, shell fragments

1283.77 - 1284.36m : Gradational change from overlying weak reaction with HCl to strong reaction with HCl, some shells

1284.69m : Small ripples with cross lams, a few lams

1285.6 - 1286.64m : Very fine sand lams more abundant towards the base, mica rich, clays with minor silt

1286.64 - 1287.8m : Very fine calcareous lams and lenses

1281.5 - 1281.51m : 4578

1282.5 - 1282.51m : 4580

1283.5 - 1283.51m : 4581

1284.5 - 1284.51m : 4582

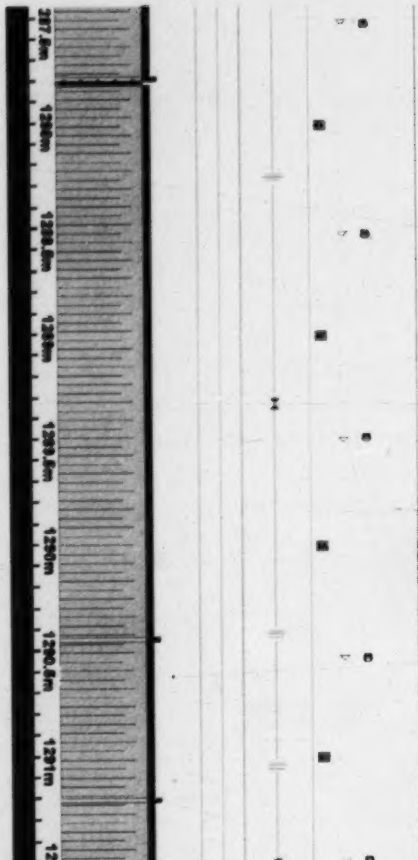
1285.5 - 1285.51m : 4583

1286.5 - 1286.51m : 4584

1286.54 - 1286.56m : 4585

1286.94 - 1286.96m : 8001

1287.5 - 1287.51m : 4586


287.5m
1288m
1288.5m
1289m
1289.5m
1290m
1290.5m
1291m
1291.5m
1292m
1292.5m
1293m
1293.5m
1294m

1288.92 - 1291.2m : Weak to no reaction with HCl, a few minor sandy lams, clays with discontinuous silt lams, mica rich, shell fragments

1291.2 - 1293.48m : Weak to no reaction, 10-15% silt, mica rich, shells, shell fragments, discontinuous silt lams

1293.48 - 1296.555m : Little to no reaction with HCl, fissile, some shell fragments, discontinuous silt lams, a few very fine sand sized grains

1287.6 - 1287.8m : Siderite?

1292m : Some minor lams and discontinuous lams of very fine sand

1287.5 - 1287.51m : 4586

1288.5 - 1288.51m : 4587

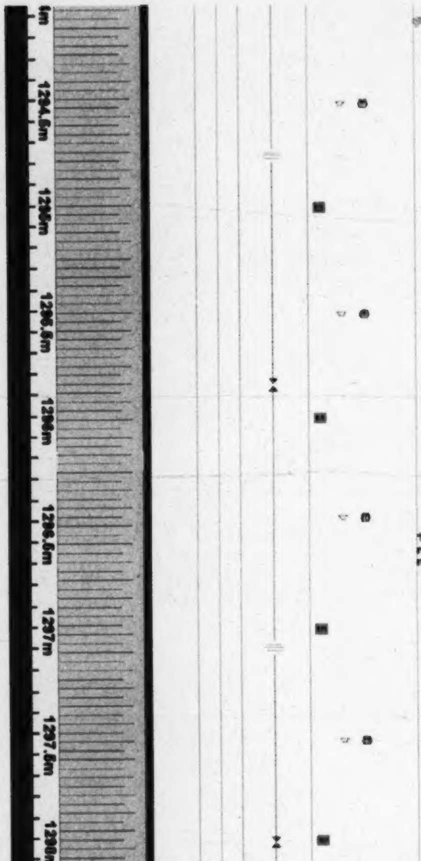
1289.5 - 1289.51m : 4588

1290.5 - 1290.51m : 6002

1291.5 - 1291.51m : 6003

1292.5 - 1292.51m : 6004

1293.5 - 1293.51m : 6005


1294.5m
1295m
1295.5m
1296m
1296.5m
1297m
1297.5m
1298m
1298.5m
1299m
1299.5m
1300m
1300.5m

1296.555 - 1296.635m : Weak reaction with HCl, some shells, mica rich

1298.84 - 1301.115m : Weak reaction with HCl, some small shell fragments, discontinuous silt lams, mica rich

1294.5 - 1294.51m : 6006

1295.5 - 1295.51m : 6007

1296.55 - 1296.51m : 6008

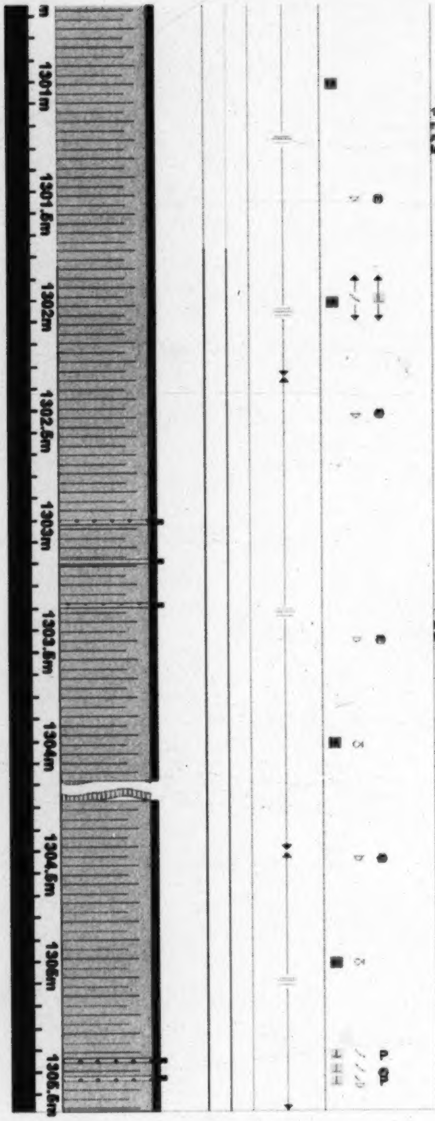
1297.5 - 1297.51m : 6009

1298.5 - 1298.51m : 6010

1299.09 - 1299.11m : 6011

1299.5 - 1299.51m : 6012

1300.5 - 1300.51m : 6013



1301.115 - 1303.395m : Weak reaction with HCl, few shells, mica rich, discontinuous silty lams

1303.395 - 1305.675m : Weak to no reaction with HCl, some fish fragments, some shells

1301.895 - 1302.1m : Appears brecciated with carbonate infilling the fractures, strong reaction with HCl

1303 - 1303.4m : A few very fine sandy lams, ripples with cross lams

1304.18 - 1304.27m : Steel grey/white bentonite

1305.415 - 1305.545m : A couple very thin lams with pyrite, brecciated shale filled with carbonate

1301.5 - 1301.51m : 6014

1301.9 - 1302.1m : 6015

1302.5 - 1302.51m : 6016

1303.5 - 1303.51m : 6017

1304.18 - 1304.27m : 6019

1304.5 - 1304.51m : 6020

1305.42 - 1305.55m : 6018

1305.5 - 1305.51m : 6021

**Well Information**

Operator: Northstar Energy Corporation
Well Name: Northstar Abee 6-11-61-22
Location:
UWI: 100061106122W400
Pool: Ellerslie Undefined (336098)
Field: Abee 3
Province / State: Alberta
Country: Canada

**Elevations**

Reference:
Cut(-) / Fill(+):
K.B. to Ground: m
Ground: 672.7 m
Kelly Bushing: 676.7 m
Casing Flange: m

**Surface Co - Ordinates**

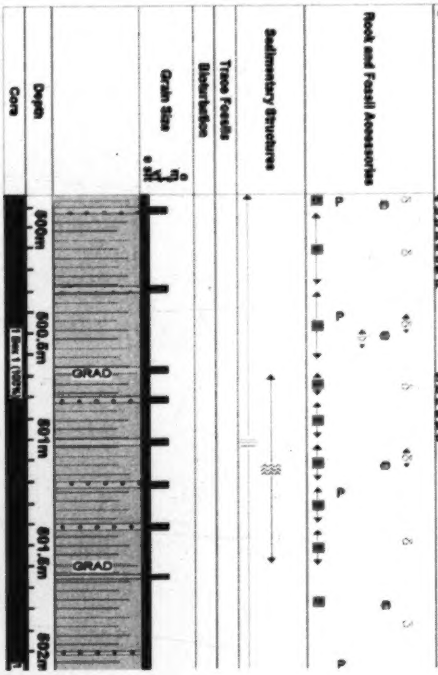
Well Type: Straight
Longitude: -113.192286
Latitude: 54.259019
N / S Co - Ordinates: 560.6
E / W Co - Ordinates: 457.0

**Bottom Hole Co - Ordinates**

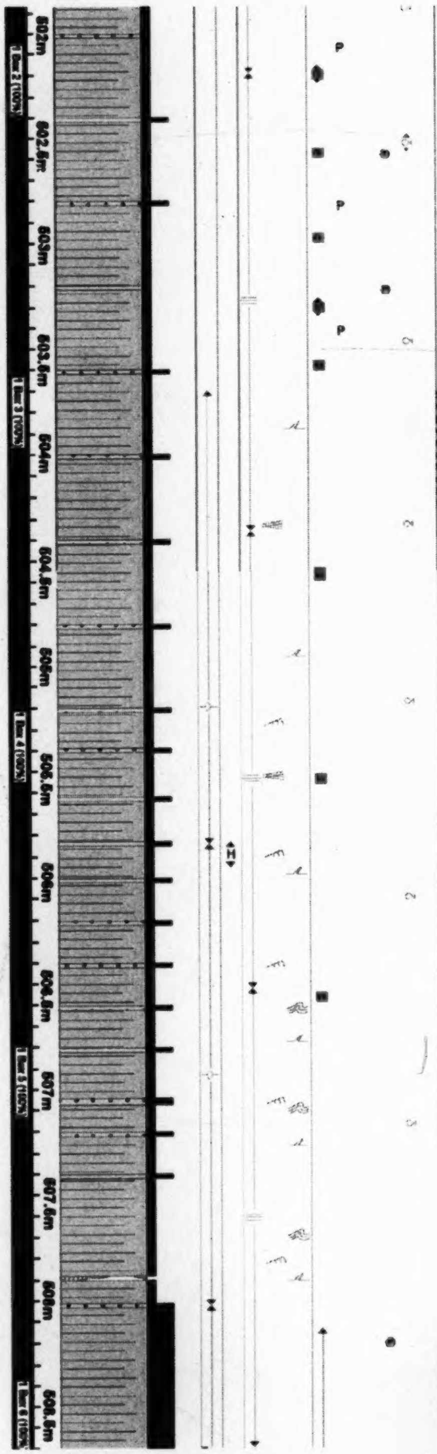
Longitude: -113.192286
Latitude: 54.259019
N / S Co - Ordinates: 560.6
E / W Co - Ordinates: 457.0

**Well Summary**

Spud Date: Feb 1, 1977
Contractor:
TD Date:
Rig Release Date: Feb 7, 1977


Core
Depth
Grain Size
Bioturbation
Trace Fossils
Sedimentary Structures
Rock and Fossil Accessories
500m
500.5m
501m
501.5m
502m
GRAD
GRAD
P
P
P
P

| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 499.85 - 503.70m : Fissile, weak to no reaction with HCl, breaking blocky, dk grey shale, some silt present, mica rich, minor disseminated pyrite, fish debris on broken surfaces, beige/grey fine sand laminations and pockets | 499.85 - 500.69m : A few sand lams | 499.94 - 500.01m 3967 |
| | | 500.505 - 500.575m : 3968 |
| 500.69 - 501.6m : Sharp contacts between shale/sand, some wave reworking?, sands increasing in abundance (2-3mm) and thickness, some wavy lams, fish debris | 500.69 - 501.6m : Increase in abundance of sand lams | |
| | | 500.975 - 501.035m : 3969 |
| | 501.6 - 503.70m : Decrease downhole in abundance and thickness of sand lams | |
| | | 501.92 - 501.99m 3970 |



503.7 - 509.80m : Burrows and trace fossils present, sharp based white/beige fine sands with undulatory tops, up to 3cm thick, ripples with low angle cross lams, discontinuous lenses, flame structures, 30% sand, 70% shale, blocky breakage, no/weak reaction with HCl, fish debris

508.13 - 512.09m : Beds becoming less distinct, intermixed sand and shale, flame structures, loading, bioturbation, dominantly sand with little shale downhole, weak to moderate reaction with HCl, breaks blocky, muddy lams are highly disturbed, micas, white specks, small ripples

Sandy pockets, slightly less silt downhole, sands are sharp based

505.25m : Start of white specks?

Thicker sands, 0.5cm, sharp based, wave reworked?, very coarse fine sand

Some trace fossils and burrowing

506.19m : Specks becoming more apparent and larger downhole

506.69m : Burrows filled with sand

507.04 - 507.07m : Sand rippled sandstone 3 cm thick, low angle cross bedding

Sharp based sands, flame structures, loading, bioturbation

507.46 - 508.13m : Abundance of sand lams decreased

507.88m : 2 mm thick steel grey bentonite

508.13 - 509.4m : Beds becoming less distinct, bioturbation, shale and sand intermixed

White specks concentrated in areas, distinction between sand and shale becoming less distinct downhole

501.92 - 501.99m
3970

502.94 - 503.01m
3971

503.91 - 503.98m
3972

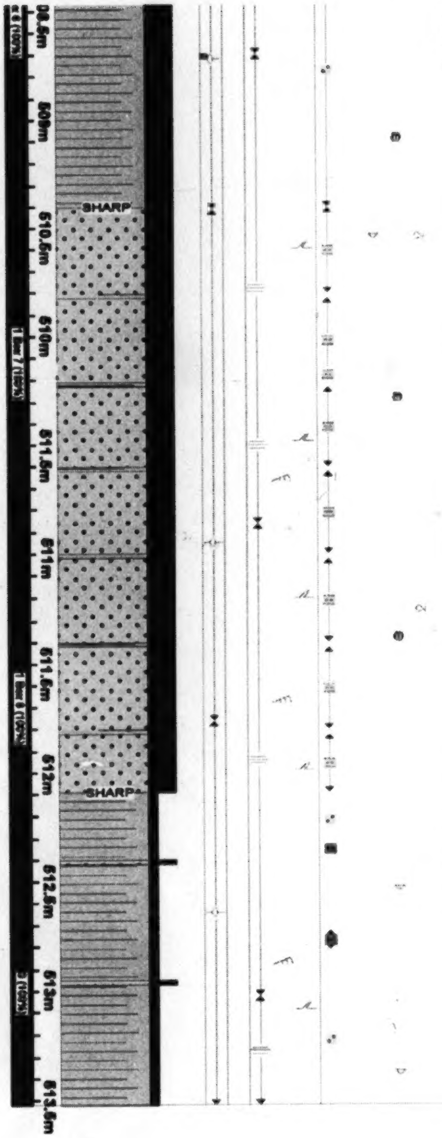
504.85 - 504.92m
3973

505.9 - 505.97m
3974

506.885 -
506.955m : 3975

507.81 - 507.88m
3976

507.94 - 508m :
3977



to moderate reaction with HCl, breaks blocky, muddy lams are highly disturbed, micas, white specks, small ripples

distinction between sand and shale becoming less distinct downhole

508.92 - 508.99m
3978

509.4m : Sharp contact between overlying mixed sand and shale and underlying sand

509.755 -
509.825m 3979

509.985 - 510.05m
: 3980

511.01 - 511.08m
3981

512.01 - 512.08m
3982

512.09 - 513.52m : Weak to no reaction with HCl, breaking blocky, 95% shale with minor fine sand lams - sharp based, small ripples, loading, flame structures, fine silty shale, some shelly material, white specks, some burrows

512.09m : Sharp contact between the overlying sand with mud and the underlying muds with sand

**Well Information**

**Operator:**
**Well Name:** Tintina 7AS01
**Location:**
**UWI:** 100061209813W400
**Pool:**
**Field:**
**Province / State:**
**Country:**

**Elevations**

**Reference:**
**Ground:** m
**Cut(-) / Fill(+):**
**Kelly Bushing:** m
**K.B. to Ground:** m
**Casing Flange:** m

**Surface Co - Ordinates**

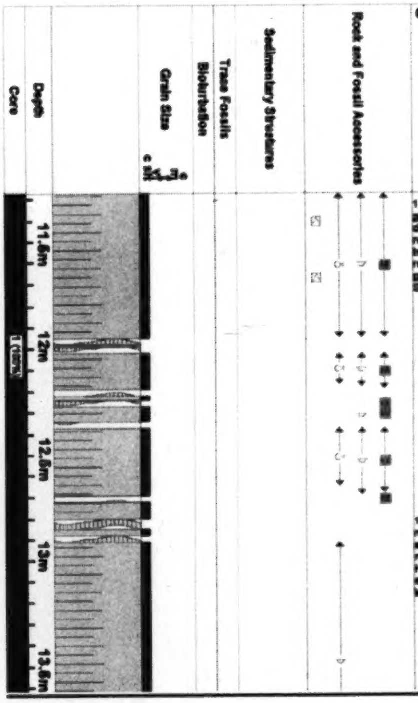
**Well Type:** Straight
**Longitude:**
**Latitude:**
**N / S Co - Ordinates:** 6372500
**E / W Co - Ordinates:** 441800

**Bottom Hole Co - Ordinates**

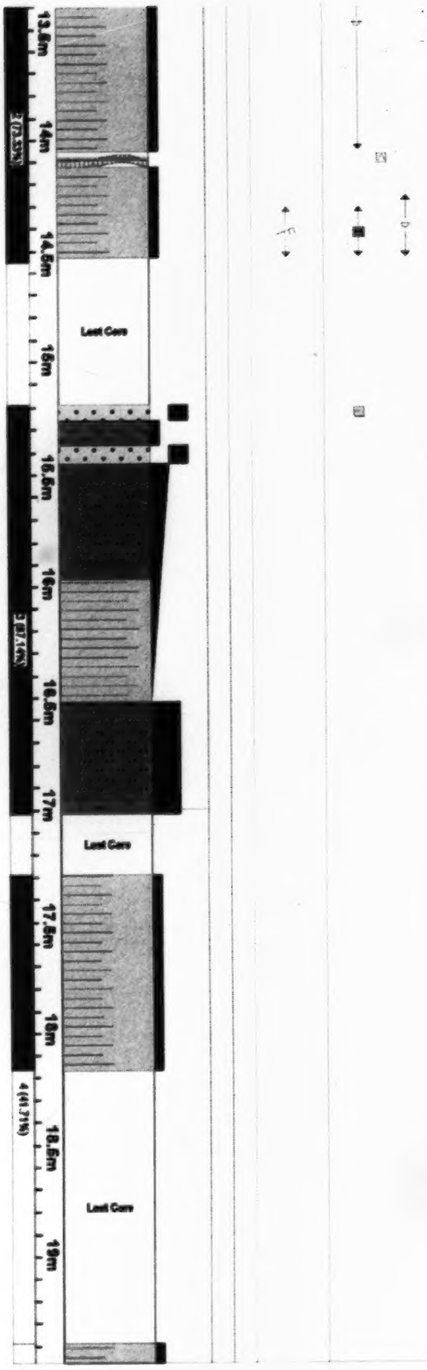
**Longitude:**
**Latitude:**
**N / S Co - Ordinates:** 6372500
**E / W Co - Ordinates:** 441800

**Well Summary**

**Spud Date:**
**Contractor:**
**TD Date:**
**Rig Release Date:**



| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 12.27 - 12.79m : Light to medium gray silty shale, occasional shell debris, bentonites, non-magnetic, no grain size breaks, blocky breakage, medium to strong reaction with HCl, sprase quartz grains, within the Second White Specks Formation | 11.27 - 11.31m : Sparse qtz grains and shell debris | 11.4 - 11.54m : 8061<br>11.6 - 11.65m : 8064 |
|  | 12 - 12.01m : 1 cm thick gray bentonite |  |
|  | 12.08m : Fine shell and organic debris | 11.98 - 12.03m : 8062 |
|  | 12.09 - 12.095m : 0.5 cm thick gray bentonite |  |
|  | 12.21 - 12.22m : Fine shell debris, 0.5 cm thick gray bentonite |  |
|  | 12.22 - 12.225m : 0.5 cm thick gray bentonite | 12.34 - 12.44m : 8063 |
|  | 12.34 - 12.35m : 1 cm thick gray bentonite |  |
|  | 12.45 - 12.46m : Gray bentonite debris over 1 cm |  |
|  | 12.45 - 12.79m : Fine to coarse shell debris (Inoceramus) throughout |  |
|  | 12.69 - 12.7m : Gray bentonite debris over 1 cm |  |
| 12.79 - 15.19m Shale: Light to medium gray silty shale, no grain size breaks, non-magnetic, moderate to strong reaction with HCl, blocky breakage, bentonites at the start and end of the interval | 12.8 - 12.85m : 5 cm mixed shale and gray bentonite |  |
|  | 12.85 - 12.855m : 0.5 cm thick gray bentonite |  |
|  | 13.29 - 13.34m : Coarse shell debris debris within shale | 13.34 - 13.46m : 8065 |



15.39 - 17.29m : Dk gray silty shale, non-magnetic, HCl reaction strong at start and then weak until last 37cm where it is a moderate reaction to HCl, blocky breakage, no bentonites, some sand

17.29 - 19.48m : Underlying Upper Shaftesbury Shales (approx. contact is 18.48m), lighter gray than overlying Second White Specks Formation

14.05 - 14.055m : 0.5 cm gray
14.09 - 14.105m : 1.5 cm gray bentonite, bentonite weathering green, sparse qtz sand grains at 14.09

14.3 - 14.53m : Occasional small pockets (isolated ripples) and laminae of qtz silt, occasional fine to medium shell debris

14.53 - 15.19m : 64 cm lost core added to the end of the interval

15.19 - 15.26m Shale: Dk gray very fine grained, comp. immature sandstone with shale clasts, re-sed unit?

15.26 - 15.37m : Dk gray shaley siltstone

15.37 - 15.45m : Light gray to white quartz rich, fine to medium grained - glacial?

15.45 - 15.98m : Dk gray coarse siltstone to very fine sandstone

15.98 - 16.24m : Dk gray siltstone/silty shale

16.24 - 16.52m : Dk gray silty shale

16.52 - 17.02m : Dk gray coarse siltstone to very fine sandstone

17.02 - 17.29m : 27 cm lost core added to the end of the interval

6065

14.03 - 14.08m : 6066

14.34 - 14.46m : 6067

15.35 - 15.38m : 6068

15.39 - 15.49m : 6069

16.77 - 16.89m : 6071

17.44 - 17.57m : 6072

19.39 - 19.48m : 6073

**Well Information**

**Operator:** Northstar Energy Corporation
**Well Name:** Northstar Radway 6-26-59-20
**Location:**
**UWI:** 100062605920W400
**Pool:** Wabamun Undefined (658098)
**Field:** Radway (752)
**Province / State:** Alberta
**Country:** Canada

**Elevations**

| | | | |
|---|---|---|---|
| **Reference:** | | **Ground:** | 644.3 m |
| **Cut(-) / Fill(+):** | | **Kelly Bushing:** | 648.3 m |
| **K.B. to Ground:** | m | **Casing Flange:** | m |

**Surface Co - Ordinates**

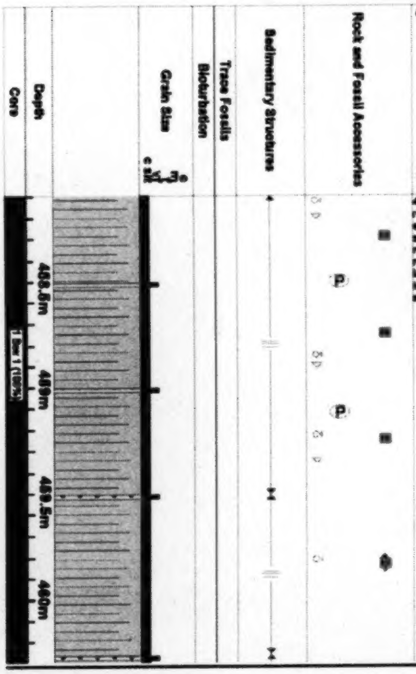
**Well Type:** Straight
**Longitude:** -112.890603
**Latitude:** 54.126511
**N / S Co - Ordinates:** 479.6
**E / W Co - Ordinates:** 589.8

**Bottom Hole Co - Ordinates**

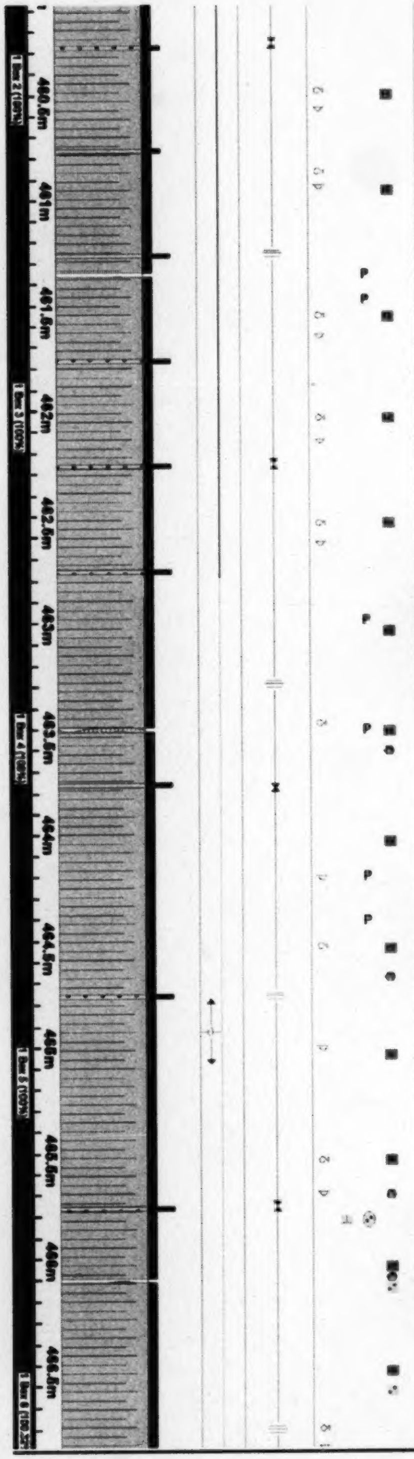
**Longitude:** -112.890603
**Latitude:** 54.126511
**N / S Co - Ordinates:** 479.6
**E / W Co - Ordinates:** 589.8

**Well Summary**

| | | | |
|---|---|---|---|
| **Spud Date:** | Feb 15, 1977 | **Contractor:** | |
| **TD Date:** | | **Rig Release Date:** | Feb 19, 1977 |



| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 458.09 - 462.50m : Strong reaction with HCl, dk gray silty shale, abundant fine to medium sand sized white specks, shelly material aligned with fissility, fish remains, pyrite nodules, shale lams and lighter gray lams interlaminated and gradational, some thin very fine sand lams | 458.09m : Large shell, 8 cm in diameter on a broken surface<br>458.09 - 458.33m : Shelly white material<br>458.33 - 458.89m : Scattered fish debris<br>458.49m : Pyrite nodule - 1cm diameter, lams are deformed above the nodule<br>Cross sections of shelly debris, many shells are larger than the core diameter and react fervently with HCl<br>458.89m : Shell and fish remains, black organics<br>459.1m : Pyrite nodules<br>459.6 - 460.4m : White specks increasing in abundance, increasing abundance of fish debris/black organics downhole<br>459.89 - 460.25m : No sand lams or shells, fish debris and white specks increasing in abundance - concentrated in lams | 458.48 - 458.535m : 201<br>459.305 - 459.375m : 4510<br>459.47 - 459.53m : 202 |



462.5 - 464.37m : Shell fragments decreasing in abundance downhole (much less abundant than boxes above), moderate reaction with HCl, white specks smaller in size, fish debris

464.37 - 465.95m : Moderate to weak reaction with HCl, minor fish debris, some shells, shale smells when in contact with HCl, dk gray

465.95 - 467.505m : Weak to no reaction with HCl, silty dk grey shale, abundant white specks, very few shells in box 6, small lenses of sand, fish debris

concentrated in lams

460.40m : Decrease in abundance downhole of white specks, sharp based sands

460.92m : Large shell, larger than the diameter of the core

461.00m : Fine grey sand lams, minor sand lenses downhole

461.34m : 2mm thick, med soft green lam (silicified?bentonite?) with disseminated pyrite

461.45m : 4mm thick sage green lam, sharp based, gradational top, soft, pyrite found in lenses

461.60m : Specks are up to med sand in size

461.9m : Cross sections through shells, coaser grains due to white specks, still silty

462.00m : Very few sand lams and lenses downhole

462.97m : 3mm thick lenses of pyrite

463.49m : 5mm green/gray lam (bentonite?), soft and regressive at the basal contact, sharp base, gradational top, pyrite in top 2mm

463.6m : Shale slightly less silty downhole, micas, a few pockets of sand

464.18m : Cross section through a shell that contains pyrite

464.38m : Pyrite lense, 0.5cm, disseminated pyrite surrounding

465.67m : Large shell

465.76 - 465.85m : Calcite infilling voids? Large clast of med grey silt/fine sand, contains white specks

466.09 - 466.1m : Very powdery white bentonite, crumbles at the touch, mica rich, slight green and yellow colouration

460.47 - 460.525m : 203

461.42 - 461.46m : 204

461.47 - 461.52m : 205

462.48 - 462.515m : 206

463.45 - 463.505m : 207

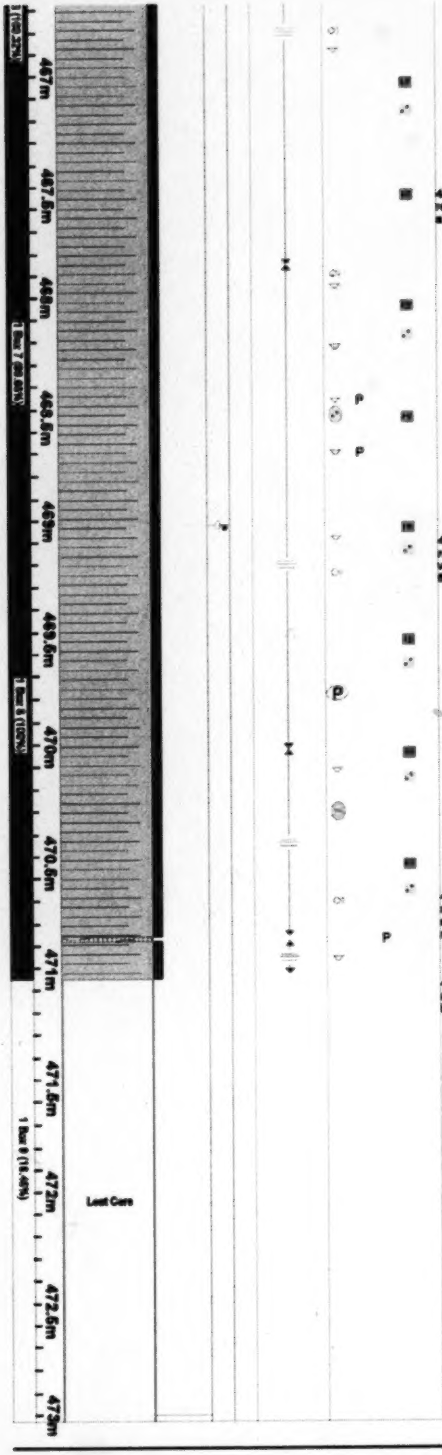
464.44 - 464.49m : 208

464.92 - 464.96m : 209

465.45 - 465.50m : 210

465.795 - 465.84m : 211

466.43 - 466.49m : 212



467.505 - 468.07m : Little to no reaction with HCl, specks are abundant

469.07 - 470.66m : Very little reaction with HCl, abundant white specks, minor scattered fish debris, minor sand lenses

470.66 - 471.05m : Moderate to strong reaction with HCl, white specks are seen, minor silt, many shells, sandy pockets

471.05 - 473.03m : Lost core arbitrarily added to the end of the box

467.5 - 467.5m : Slightly siltier at the base of box 6

467.92m : Large shells, larger than the diameter of the core, some fish remains

468.2m : Shells up to 3mm in thickness

468.44m : Thick shelly layer (0.5cm) with stacked shells, with light gray clast of fine sand and disseminated pyrite underlying the shells

468.68m : Shelly layer with pyrite

469.00m : Tiny burrow?

469.07m : A little shelly debris

469.76 - 469.765m : 0.5cm diameter pyrite nodule

470.1 - 470.1m : Smaller shells, 1-2cm in thickness

470.2 - 470.2m : HCl reaction increasing to moderate/strong, shelly debris increasing in abundance

470.28 - 470.31m : Brown, soft clast of mud

470.8 - 470.8m : Sandy pockets/lenses and shells at the base of the box

470.86 - 470.88m : Thin green/blue layer, soft bentonite, thickens and thins, pyrite lenses

467.62 - 467.675m : 213

468.435 - 467.58m : 214

469.42 - 469.47m : 215

469.77 - 469.8m : 216

470.77 - 470.84m : 4511

471.49 - 471.53m : 218

**Well Information**

**Operator:** Omers Resources Limited
**Well Name:** Amoco Pembina
**Location:**
**UWI:** 100063104608W500
**Pool:** Viking, Mannville, Jurassic... (220360)
**Field:** Pembina (685)
**Province / State:** Alberta
**Country:** Canada

**Elevations**

**Reference:**
**Cut(-) / Fill(+):**
**K.B. to Ground:** m
**Ground:** 889.7 m
**Kelly Bushing:** 894.8 m
**Casing Flange:** m

**Surface Co - Ordinates**

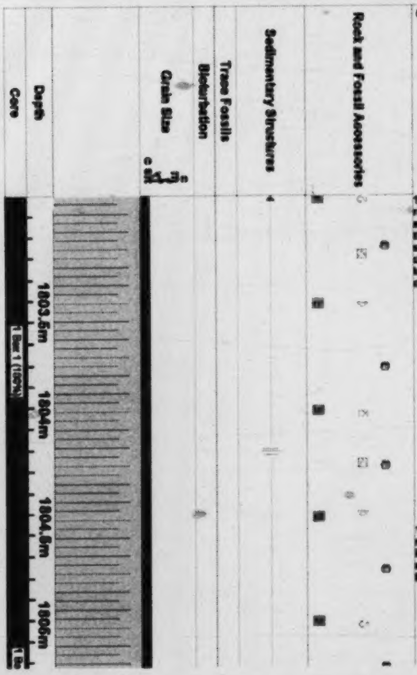
**Well Type:** Straight
**Longitude:** -115.152694
**Latitude:** 53.008381
**N / S Co - Ordinates:** 548.6
**E / W Co - Ordinates:** 547.5

**Bottom Hole Co - Ordinates**

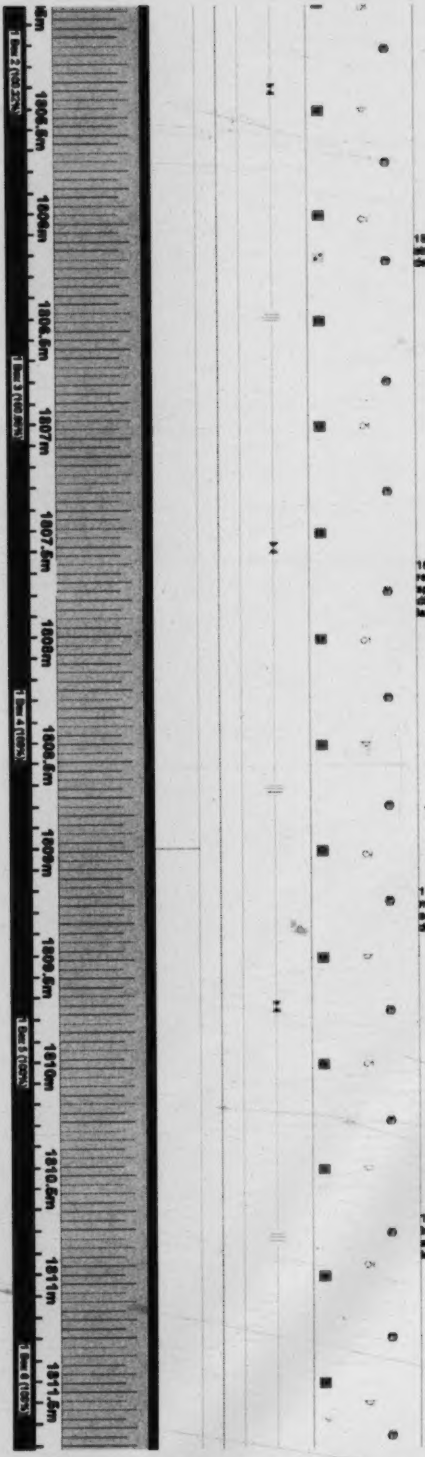
**Longitude:** -115.152694
**Latitude:** 53.008381
**N / S Co - Ordinates:** 548.6
**E / W Co - Ordinates:** 547.5

**Well Summary**

**Spud Date:** Feb 28, 1986
**TD Date:**
**Contractor:**
**Rig Release Date:** Mar 27, 1986


Core
Depth
Grain Size
Bioturbation
Trace Fossils
Sedimentary Structures
Rock and Fossil Accessories
1803.5m
1804m
1804.5m
1805m
1 Box 1 (100%)

| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 1803 - 1804.55m : Low to moderate reaction with HCl (low at the top of the box, moderate at the base of the box), dk grey shale, clays with minor discontinuous and continuous silt lams, fissile, mica rich, fish debris, quartz grains, shells | 1803.05m : Concentrations of organic debris | 1803.15 - 1803.22m : 3986 |
| | 1803.40m : Start to see lams of silt downhole | 1803.41 - 1803.43m : 356 |
| | | 1804.4 - 1804.42m : 357 |
| 1804.55 - 1806.095m : Low to moderate reaction with HCl, fissile, mica rich, discontinuous and continuous silt lams, fish fragments, shells | | |


1805.5m
1 Box 2 (100.32%)
1806m
1806.5m
1 Box 3 (100.86%)
1807m
1807.5m
1808m
1 Box 4 (100%)
1808.5m
1809m
1809.5m
1 Box 5 (100%)
1810m
1810.5m
1811m
1 Box 6 (100%)
1811.5m

1805.44 - 1805.46m : 358

1806.1 - 1807.64m : Moderate to strong reaction with HCl, fish debris

1806.2m : Some very fine grained sand pockets

1806.36 - 1806.42m : 359

1807.45 - 1807.52m : 360

1807.64 - 1809.18m : Moderate reaction with HCl, no white specks, mica rich dk grey shale, discontinuous and continuous silt lams, some fish debris and shells

1807.64m : Vitreous black organic matter

1807.62 - 1807.64m : 361

1808m : Abundent laminations of silt

1808.32 - 1808.38m : 362

1809.18 - 1810.72m : Low to moderate reaction with HCl, some silty lams, some fish debris, some shells

1809.36 - 1809.39m : 363

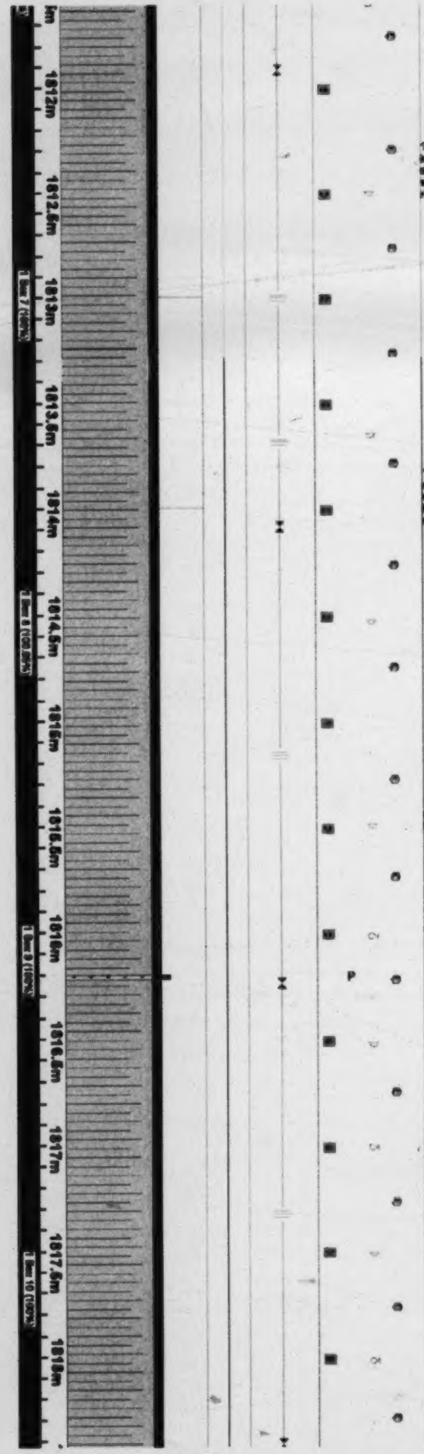
1809.95m : Vitreous black organic matter

1810.36 - 1810.42m : 364

1810.72 - 1812.29m : Moderate to strong reaction with HCl, rare shells, rare fish debris, some silt lams

1811.29m : Black vitreous organic matter - breaking conchoidally

1811.36 - 1811.43m : 365


1812m
1812.5m
1813m
1813.5m
1814m
1814.5m
1815m
1815.5m
1816m
1816.5m
1817m
1817.5m
1818m
1 Sec 7 (100%)
1 Sec 8 (103.8%)
1 Sec 9 (100%)
1 Sec 10 (100%)
P

1812.28 - 1813.81m : Moderate to strong reaction with HCl, dominently dk gray shale, minor silt lams and silt lenses, mica rich, minor shells

1813.81 - 1815.355m : Strong reaction with HCl, fine grained, no visible change in grain size, fissile, shell fragments, silt lams and lenses

1815.355 - 1816.905m : Strong reaction with HCl, dk gray shale, fissile, shells, fish fragments

1816.905 - 1818.445m : Moderate to strong reaction with HCl, mica rich, some fish debris and shelly debris, some silt lams and silt lenses

1812.88m : Vitreous black organic lams, a few silty lams

1815.8m : White specks?

1816.2m : Light gray upper very fine sand lams with disseminated pyrite

1816.3m : Vitreous black organic matter

1817m : Organic lam, shells

1812.14 - 1812.21m : 365

1812.3 - 1812.34m : 366

1813.34 - 1813.38m : 367

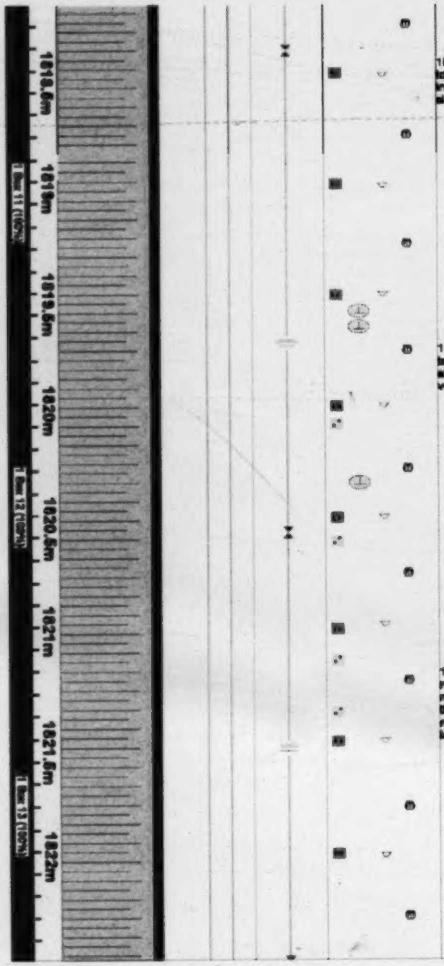
1814.31 - 1814.36m : 368

1815.25 - 1815.29m : 369

1816.36 - 1816.42m : 370

1817.31 - 1817.37m : 371

1818.19 - 1818.23m : 372


1818.5m
1819m
1819.5m
1820m
1820.5m
1821m
1821.5m
1822m
1 Box 11 (100%)
1 Box 12 (100%)
1 Box 13 (100%)

1818.445 - 1819.735 m : Strong to moderate reaction with HCl, increased abundance of shells, silt lams and lenses

1819.735 - 1821.185m : Strong to moderate reaction with HCl, abundant shells, some silty and very fine sand lams

1821.185 - 1822.495m : Strong reaction with HCl, black organic material dispersed throughout the shale, fine clays, abundant micas, abundant shells, some silt lams and lenses

1818.84m : Abundant shells downhole

1819.575 - 1819.845m : 2 elliptical calcite nodules

1820.35 - 1820.375m : Elliptical calcite nodule

1821.37m : Sandier lam, white specks?

1818.19 -
1818.23m : 372

1819.09 -
1819.14m : 3964

1819.15 -
1819.22m : 373

1820.27 -
1820.31m : 374

1821.19 -
1821.22m : 375

1821.57 -
1821.61m : 3983

1822.11 -
1822.18m : 376

**Well Information**

| | |
|---|---|
| Operator: | **Anadarko Canada Corporation** |
| Well Name: | **Grt Pins Thorhild 6-35-59-21** |
| Location: | |
| UWI: | 100063505921W400 |
| Pool: | Unknown |
| Field: | Thorhild (903) |
| Province / State: | Alberta |
| Country: | Canada |

**Elevations**

| | | | |
|---|---|---|---|
| Reference: | | Ground: | 641.6 m |
| Cut(-) / Fill(+): | | Kelly Bushing: | 643.4 m |
| K.B. to Ground: | m | Casing Flange: | m |

**Surface Co - Ordinates**

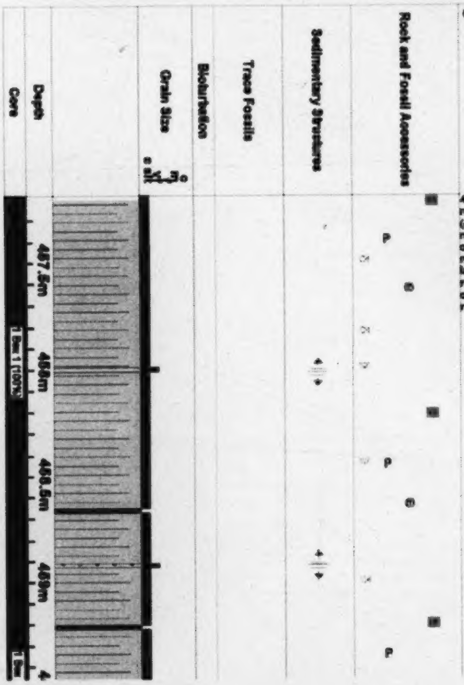
| | |
|---|---|
| Well Type: | Straight |
| Longitude: | -113.040407 |
| Latitude: | 54.142405 |
| N / S Co - Ordinates: | 603.8 |
| E / W Co - Ordinates: | 602.8 |

**Bottom Hole Co - Ordinates**

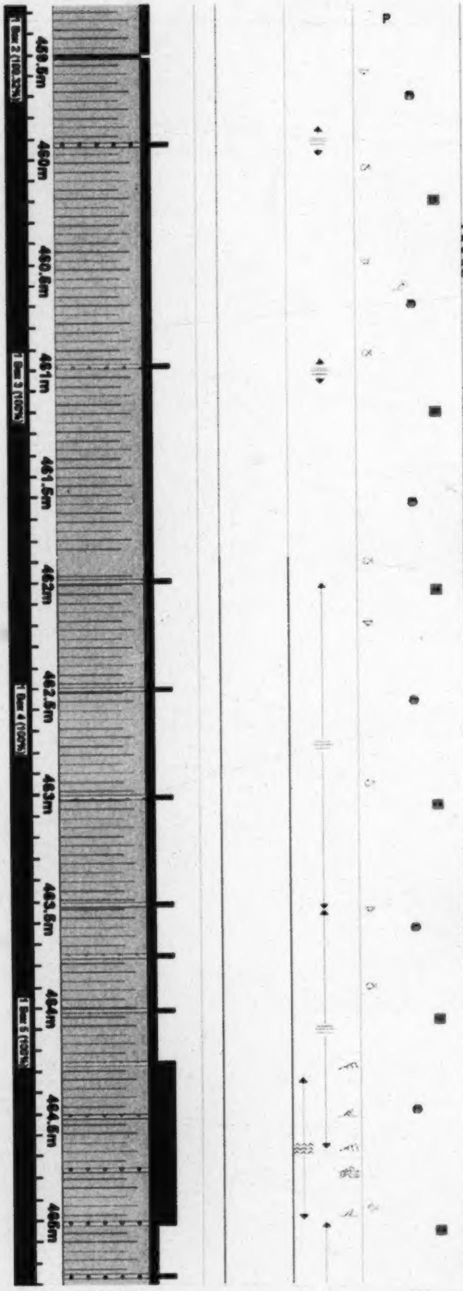
| | |
|---|---|
| Longitude: | -113.040407 |
| Latitude: | 54.142405 |
| N / S Co - Ordinates: | 603.8 |
| E / W Co - Ordinates: | 602.8 |

**Well Summary**

| | | | |
|---|---|---|---|
| Spud Date: | Jun 4, 1964 | Contractor: | |
| TD Date: | | Rig Release Date: | Jun 14, 1964 |



| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 457.16 - 460.30m : Weak to no reaction with HCl. dk gray shale (clay with low abundance of silt), mud covered surfaces - hard to observe features, fissile, micas, minor <0.5% pyrite, a few sand lams - very fine grained, platey, no white specks observed, areas of core protrude, other areas are recessive, fish debris, organics | 457.46m : Abundant fish debris and black organics<br>1mm thick sand lenses | 457.5 - 457m 3949 |
| | 457.96m : Shelly lense<br>Minor discontinuous sand lenses | |
| | 458.42m : Large shell and cast<br>458.49 - 460.04m : Protruding lams, very hard, brownish coloured, more resistant than surrounding material, max a few mms thick, can see parallel structures, reacts slighdy with HCl -siderite?bioclastics?<br>Parallel sand lams and siderite downhole | 458.465 - 458.555m : 3950 |



460.3 - 461.86m : Little to no reaction with HCl, slight light and darker coloured bands in the shale - silt sized lams - less than 5%

461.86 - 463.42m : Almost no reaction with HCl, micas, some fish debris, a few shells, sand lams becoming more prominent downhole, lams are parallel, minor silt

463.42 - 464.98m : Weak to no reaction with HCl, sand laminations up to 5mm in thickness, wave reworking?, number and thickness of sand lams are increasing downhole

465 - 466.12m : Sand and shale lams becoming more distinct, moderate to weak reaction with HCl, dk grey shale, black organics, fish remains, micas,

Very few sandy lams, some isolated sand lenses, sand is fine grained and white

463.52m : A few shells

464.2 - 465.00m : Sand lams becoming undulatory, more sandy lenses, sharp based sands, wave reworking?, sand becoming completely intermixed with shale, up to 30% sand, black organics, micas, silty shale, ripples cross lams, flames

459.515 - 459.585m : 3951

460.5 - 460.57m. 3952

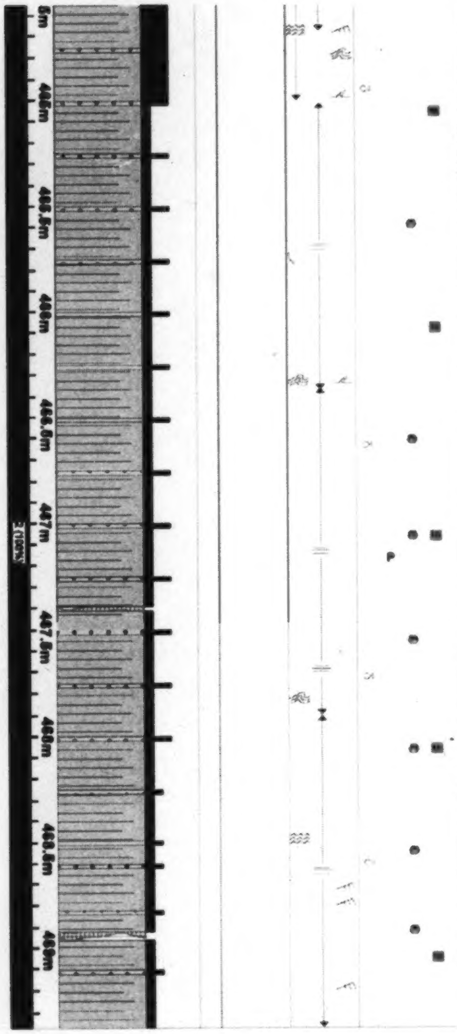
461.49 - 461.56m: 3953

462.54 - 462.61m : 3954

463.53 - 463.6m: 3955

464.48 - 464.55m: 3956

464.96 - 465m. 3958



flames

3956

464.96 - 465m: 3956

465 - 466.12m : Sand and shale lams becoming more distinct, moderate to weak reaction with HCl, dk gray shale, black organics, fish remains, micas, silty shale, discontinuous sand lenses, fine sand from 10-15%, fissile

465.49 - 465.56m: 3957

466.01 - 466.08m: 3959

466.12 - 467.9m : Strong reaction with HCl, white specks apparent

466.3m : Loading, flame structures

466.8m : Black organic matter, large amounts of fish debris, white specks very abundant

466.995 - 467.065m : 3960

467.15m : Mica rich, pyrite <0.5%, fine white sand lenses, parallel lams

467.39 - 467.4m : Bentonite - steel grey with green colouration at the base and slightly brown at the top contact

467.515 - 467.585m : 3961

467.69m : Minor fish debris in shale

467.81m : Sand lams are thinner and less abundant, soft sed deformation

467.9 - 467.97m: 3962

467.9 - 469.37m : Vigorous reaction with HCl, breaking along fissility, white specks are fine sand sized coarse and abundant, dk gray shale with minor silt, muddy surfaces with shrinkage cracks, micas, very fine grained sharp based sand lams, some parallel lams, some ripples with low angle cross lams, fish debris

468.235 - 468.25m : Sand lam 1.5cm thick

468.51m : Sand/shale lams, undulatory surfaces

468.51 - 468.59m : No sand lams

468.59m : Ripples

468.79m : Sand ripples, thick cm lams of sand can now be observed

468.935 - 468.95m : Steel grey bentonite with green at the top contact and sharp contacts, abundant micas, surrounding minor thinner bentonites

468.975 - 469.045m : 3963

**Well Information**

| | |
|---|---|
| **Operator:** | **Hunt, Lamar and Caroline** |
| **Well Name:** | **HCS Et Al Beavercreek 9-9-56-19** |
| **Location:** | |
| **UWI:** | 100090905619W500 |
| **Pool:** | Uknown |
| **Field:** | Pine Creek (706) |
| **Province / State:** | Alberta |
| **Country:** | Canada |

**Elevations**

| | | | |
|---|---|---|---|
| **Reference:** | | **Ground:** | 1165.9 m |
| **Cut(-) / Fill(+):** | | **Kelly Bushing:** | 1170.7 m |
| **K.B. to Ground:** | m | **Casing Flange:** | m |

**Surface Co - Ordinates**

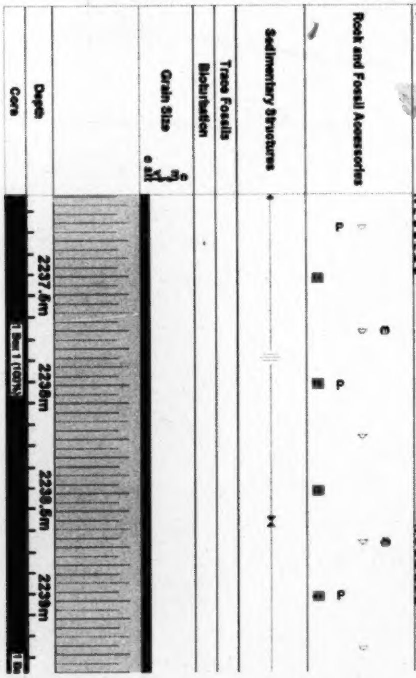
| | |
|---|---|
| **Well Type:** | Straight |
| **Longitude:** | -116.755651 |
| **Latitude:** | 53.827446 |
| **N / S Co - Ordinates:** | 492.2 |
| **E / W Co - Ordinates:** | 355.6 |

**Bottom Hole Co - Ordinates**

| | |
|---|---|
| **Longitude:** | -116.755651 |
| **Latitude:** | 53.827446 |
| **N / S Co - Ordinates:** | 492.2 |
| **E / W Co - Ordinates:** | 355.6 |

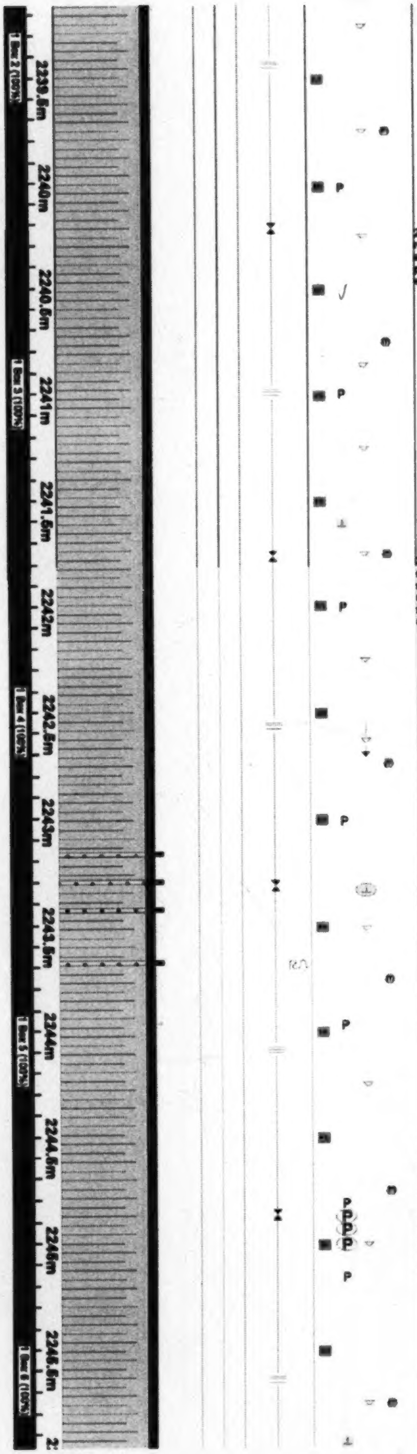
**Well Summary**

| | | | |
|---|---|---|---|
| **Spud Date:** | Dec 2, 1973 | **Contractor:** | |
| **TD Date:** | | **Rig Release Date:** | Jan 24, 1974 |



| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 2237.12 - 2238.67m : Weak to moderate reaction with HCl, <5% silty clay, dk gray shale, some silt pockets, broken, very rubbly, mica rich, shells and Inoceramus imprints very common, some shells are pyritized | 2237.27m : Pyritized shell<br>Large Inoceramus imprints<br>Laminations react with HCl | |
| | | 2237.6 - 2237.64m : 462 |
| | Segments of shell are pyritized | 2238.11 - 2238.15m : 4520 |
| 2238.67 - 2240.22m : Weak to moderate reaction with HCl, abundant large Inoceramus imprints, shelly debris, silt pockets, breaking blocky and rubbly, some pyritized shells, trace pyrite in shale | | 2238.62 - 2238.66m : 463 |

4



2240.22 - 2241.77m : Moderate reaction with HCl, shells and shelly debris, some shells are pyritized, some laminations react with HCl, minor silt, silty pockets.

2241.77 - 2243.32m : Strong reaction with HCl, dk gray shale, some laminations, pyritized shells, abundant shells and shelly debris - not as abundant as box 3

2243.32 - 2244.87m : Strong reaction with HCl

When HCl is applied, some lams can be seen due to a vigorous reaction with HCl

2244.87 - 2246.42m : Strong reaction with HCl, some lams react more vigorously than others, minor silt, mostly discontinuous lenses, shells and shelly debris

2240.67m : Strong reaction with HCl downhole

2240.85m : Large Inoceramus

2241.6m : Thin calcareous laminations, react with HCl

A few very thin lams of silt sized particles

Shell imprints

Silty pockets
2242.56 - 2242.72m : Abundant laminations with shelly debris and bioclasts

Minor small white laminations <1mm

2243.18 - 2243.42m : Very fine sandy sharp based lams, reacts with HCl

Large elliptical calcite concretion

2243.32 - 2243.42m : Thin very fine sand lams full of calcareous material which reacts with HCl

2243.675 - 2243.68m : Lams with very fine sand, reacts with HCl, minor loading

2243.97m : Thin lams which react with HCl and disseminated pyrite

2244.815m : Pyrite lense
2244.87 - 2245.02m : Pyrite nodules up to 1cm in diameter

2245.155m : Thin pyrite lam

2245.93 - 2246.42m : Very thin

2239.61 - 2249.66m : 464

2240.2 - 2240.22m : 465

2240.59 - 2240.63m : 466

2241.59 - 2241.63m : 467

2242.55 - 2242.62m : 469

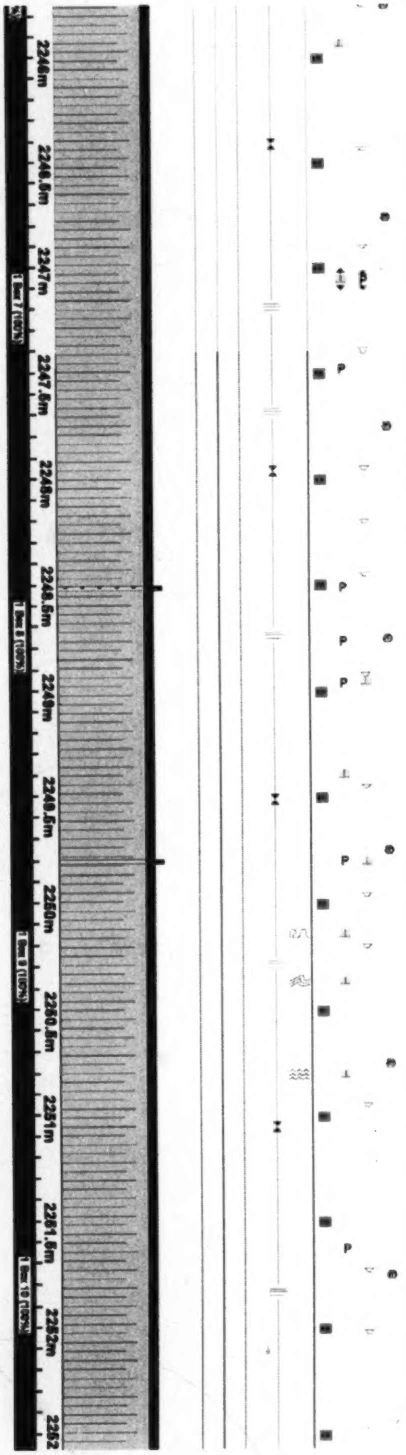
2242.6 - 2242.64m : 468

2243.58 - 2243.61m : 470

2243.57 - 2243.58m : 471

2244.58 - 2244.65m : 472

2245.6 - 2245.64m : 473



2246.42- 2247.97m : Strong reaction with HCl (often reacting with certain lams), silty discontinuous lenses

2247.97 - 2249.52m : Moderate reaction with HCl, mica rich, some silty discontinuous lenses, dominantly clay, dk grey shale, Inoceramus shells

2249.52 - 2251.07m : Strong reaction with HCl, clay with minor silt, shelly debris, rubbly debris

2251.07 - 2252.62m : Strong reaction with HCl, mica rich, minor silt, silty discontinuous lams, minor shells

2245.83 - 2246.42m : Very thin calcareous lams and shelly debris

2246.42 - 2247m : Very thin calcareous lams and shelly debris

2246.9m : Smaller Inoceramus approximately 1.5cm in diameter

2247m : Start to see more Inoceramus

2247.075 - 2247.12m : Lams react with HCl and full of disseminated pyrite

2247.48m : Pyrite lam

2247.52 - 2247.57m : Very thin calcareous lams

Mica rich

2248.2m : A few calcareous lams and cross sections through shells

2248.5m : Discontinuous lenses

2248.51m : Thin calcareous sand lams, sharp based with disseminated pyrite

2248.75 - 2248.8m : Many thin calcareous (up to 0.5 cm thick) lams with pyrite lams

2248.95m : 0.5cm thick porous calcareous lam filled with pyrite

2249.4m : Few calcareous lams

2249.8m : Fine sand sized calcareous beds (1cm), full of pyrite

2250.14m : Thin calcareous lams with some current reworking? soft sediment deformation

2250.2m : Some shells, shell imprints and shelly debris

2250.36m : Deformed calcareous lams

2250.8m : Calcareous lams, often wavy

2251m : Abundant lams

2251.615 - 2251.665m : Concentrated lams, some filled with pyrite, sharp based

Very small Inorceramus

2246.23 - 2246.3m : 474

2246.52 - 2246.56m : 475

2247.57 - 2247.62m : 476

2248.55 - 2248.6m : 477

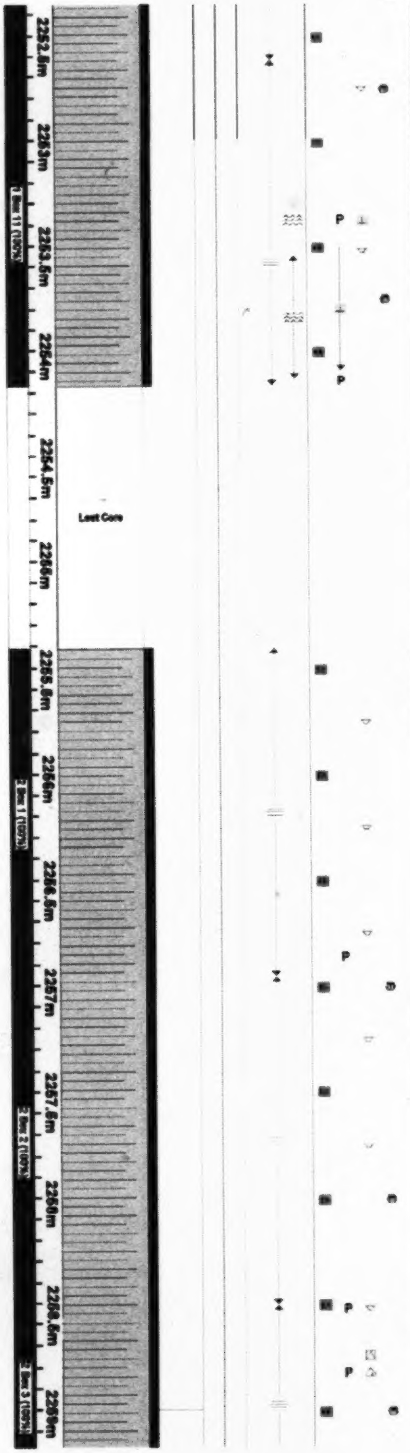
2248.75 - 2248.8m : 478

2249.56 - 2249.6m : 479

2250.2 - 2250.27m : 4521

2250.56 - 2250.61m : 480

2251.5 - 2251.54m : 481


2252.5m
2253m
2253.5m
2254m
2254.5m
2255m
2255.5m
2256m
2256.5m
2257m
2257.5m
2258m
2258.5m
2259m
1 Box 11 (100%)
2 Box 1 (100%)
2 Box 2 (100%)
2 Box 3 (100%)
Lost Core
P
P
P
P
P

2252.62 - 2254.17m : Strong reaction with HCl, mica rich, rare shells (less abundant Inoceramus then above boxes), discontinuous lenses of silt

2252.55 - 2252.6m : 482

2253.37 - 2253.375m : Thickening and thining calcareous laminations full of pyrite

2253.55 - 2254.14m : Many mm thick calcareous lams, some horizontal, some are wavy

2253.58 - 2253.64m : 483

2254.14m : Lam full of pyrite

2254.17 - 2255.41m : Lost core arbitrarily tacked onto the end of the interval

2255.41 - 2256.96m : Low to no reaction with HCl, shale is completely rubble in box, some shells and shelly debris, shell imprints, dominantly clays with minor silt, silty discontinuous lenses

2255.79 - 2255.83m : 484

2256.79 - 2256.84m : 485

2256.86m : Pyrite laminations (lams from 1-2mm in thickness), full of pyrite

2256.96 - 2256.97m : 486

2256.96 - 2258.51m : Weak to no reaction with HCl, completely rubble, hard to see features, dominantly clays, minor silt, silty discontinuous lenses, rich in micas, sections of shell. bioclastic material is decreasing in abundance downhole

2257.81 - 2257.85m : 487

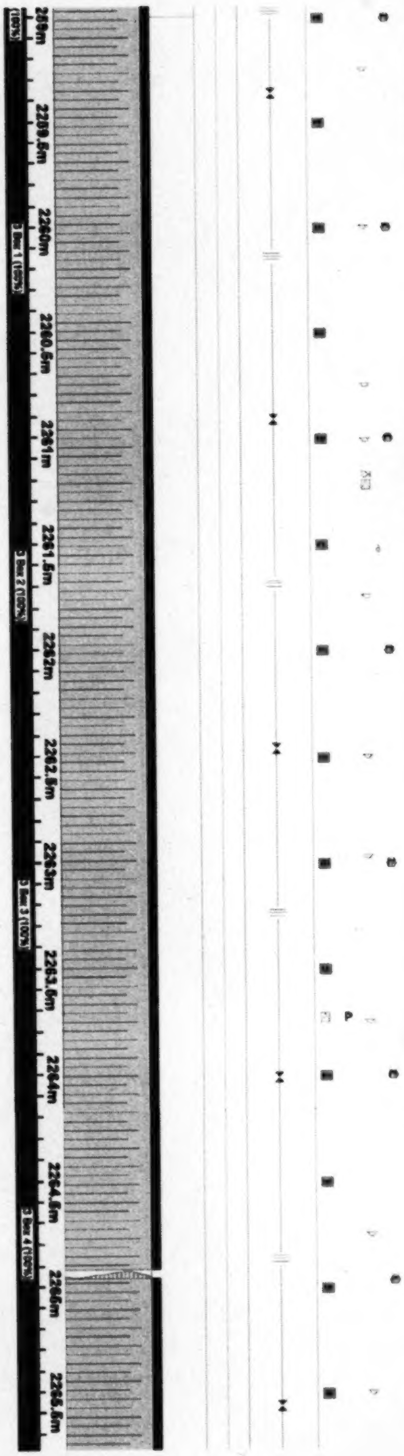
2258.51 - 2259.37m : Little to no reaction with HCl, clays with little silt, discontinuous silty lenses

Pyritized shell

Quartz grains

Pyritized shells, pyritized gastropod

2258.81 - 2258.86m : 488



(100%)
259m
2259.5m
2260m
3 Box 1 (100%)
2260.5m
2261m
2261.5m
3 Box 2 (100%)
2262m
2262.5m
2263m
3 Box 3 (100%)
2263.5m
2264m
2264.5m
3 Box 4 (100%)
2265m
2265.5m
P

2259.37 - 2261.92m : Weak reaction with HCl, rubble, a few shells, clay rich, some silt, discontinuous lenses of silt, mica rich

2259.9 - 2259.95m : 489

2260.92 - 2262.47m : Weak to moderate reaction with HCl, certain lame react more vigorously with HCl, completely rubble, dk gray to black in colour, some silt is dispersed within clay, some discontinuous silty lenses, mica rich

A few shells

2261.17m : Fish debris layer, concentration of organic debris

2261.22m : Concentration of quartz grains

2260.92 - 2260.96m : 490

2261.91 - 2261.96m : 491

2262.47 - 2264.02m : Weak to moderate reaction with HCl, clays with minor silt, a few shells, discontinuous silty lenses

2262.97m : Shells

2262.9 - 2262.95m : 492

2263.73m : Pyrite and quartz grains within concentrations of silt

2263.88 - 2263.92m : 493

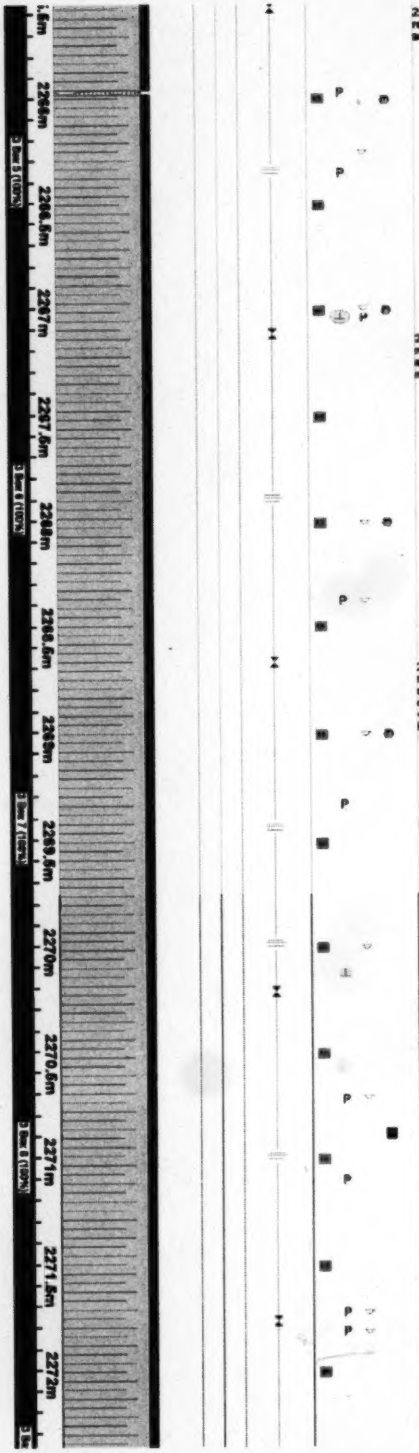
2264.02 - 2265.57m : Weak to moderate reaction with HCl, some sections of shells, clays, many micas, discontinuous silty lenses

2264.92 - 2264.95m : Bentonite? Silicified? Greenish-grey coloured, full of micas

2264.91 - 2264.96m : 494

2265.4 - 2265.42m : 495

2265.57 - 2267.12m : Moderate reaction with HCl, some shells, some discontinuous lenses of silt



2265.57 - 2267.12m : Moderate reaction with HCl, some shells, some discontinuous lenses of silt

2267.12 - 2268.67m : Low reaction with HCl, some small shells, clays with abundant micas, silty discontinuous lenses

2268.67 - 2270.22m : Weak reaction with HCl, clays with some silt, mica rich, disseminated grains of pyrite <1%, a few shells and shell imprints

2270.22 - 2271.77m : Weak to moderate reaction with HCl (some lams react more vigorously with HCl than others), shells and shelly fragments, discontinuous silty lenses.

2271.77 - 2273.09m : Weak reaction with HCl, a few shells, clays with minor silt, discontinuous silt lenses, shells

2265.965m : Green coloured lam - bentonite? Silicified? Concentrated pyrite

2266.35 - 2266.355m : Pyrite lam

2267.02 - 2267.075m : Calcite nodule, lighter grey ellipse with pyrite concentrated rim

A few pyritized shelly fragments

2269.17 - 2269.27m : Some thin parallel silt lams

Silty discontinuous lenses

Thin lams

Calcareous lams

2270.72m : Large pyritized shell

2270.88m : Black vitreous lams/lenses - coal?

2271.1m : Disseminated pyrite

Pyrite replacing shell fragments,

Pyritized shell

2265.92 - 2265.96m : 496

2266.87 - 2266.92m : 497

2267.02 - 2267.06m : 498

2267.96 - 2268.01m : 499

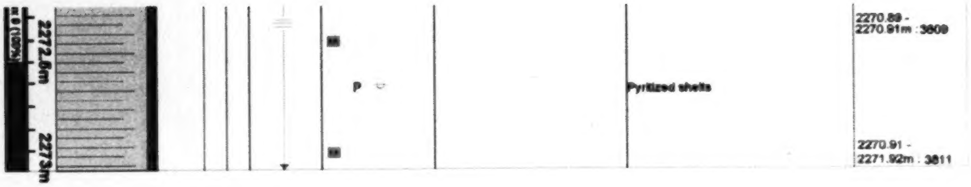
2268.9 - 2268.95m : 500

2269.91 - 2269.96m : 3807

2270.27 - 2270.34m : 4522

2270.89 - 2270.94m : 3808

2271.88 - 2271.93m : 3810


2272.6m
2273m
P
Pyritized shells
2270.89 -
2270.91m : 3809
2270.91 -
2271.92m : 3811

## Well Information

Operator: Canadian Natural Resources Limited
Well Name: Rax Et Al Ante 10-9-66-23
Location:
UWI: 100100906623W500
Pool: Unknown
Field: Amte Creek (55)
Province / State: Alberta
Country: Canada

## Elevations

Reference:
Cut(-) / Fill(+):
K.B. to Ground: m
Ground: 773 m
Kelly Bushing: 779.1 m
Casing Flange: m

## Surface Co - Ordinates

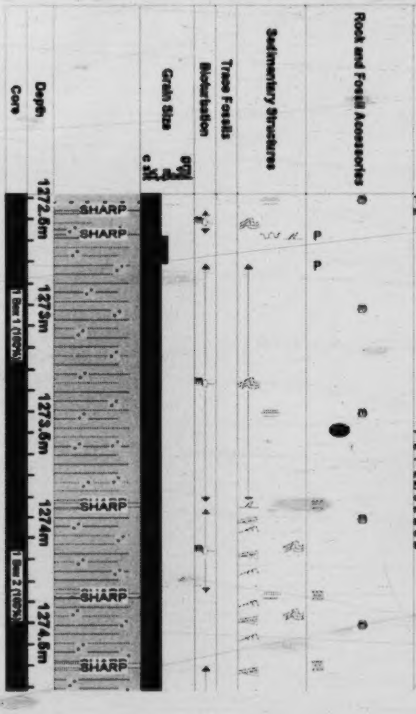
Well Type: Straight
Longitude: 117.410259
Latitude: 54.700355
N / S Co - Ordinates: 514.4
E / W Co - Ordinates: 453.1

## Bottom Hole Co - Ordinates

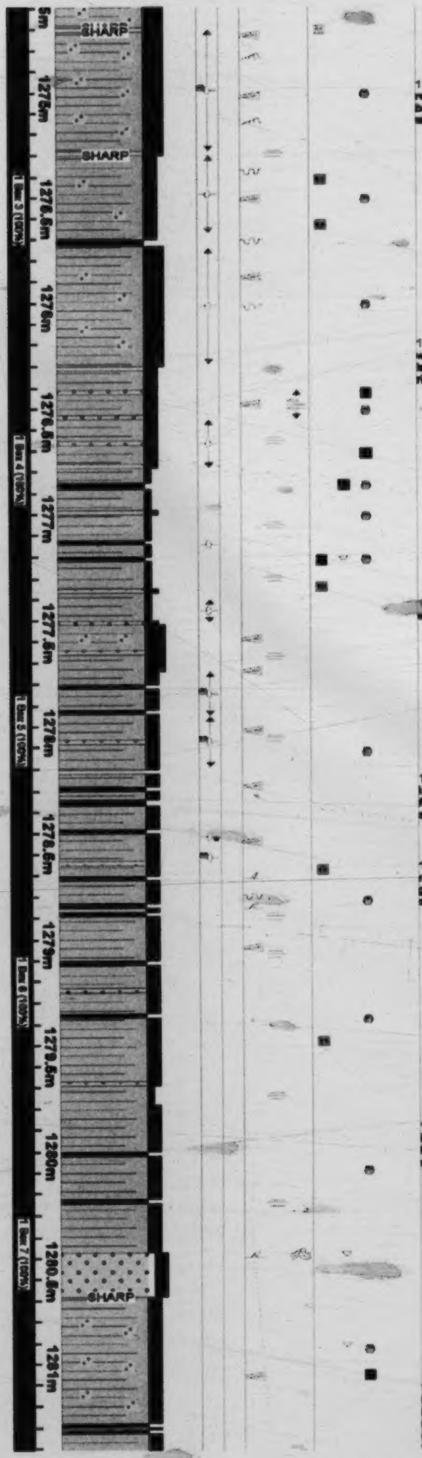
Longitude: 117.410259
Latitude: 54.700355
N / S Co - Ordinates: 514.4
E / W Co - Ordinates: 453.1

## Well Summary

Spud Date: Sep 6, 1976
Contractor:
TD Date:
Rig Release Date: Oct 10, 1976



| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 1272.48 - 1273.71m : Strong to no reaction with HCl, mica rich | 1272.48 - 1272.555m : Moderate reaction with HCl, parallel lams, fine sand, dk organic rich lams, undulatory sharp basal contact | |
| | 1272.555 - 1272.67m : Little to no reaction with HCl, bioturbated, soft sed. loading, shale with fine sand, basal contact is sharp with flames and loading | 1272.71 - 1272.79m : 3845 |
| | 1272.67 - 1272.81m : Moderate to strong reaction with HCl, medium to fine sand and pepper coloured sand full of pyrite, little to no bioturbation, basal contact is gradual | |
| | 1272.81 - 1273.93m : Weak to no reaction with HCl, bioturbated, 40% shale and 60% fine salt and pepper coloured sand, original sedimentary structures can no longer be observed, convoluted bedding | |
| 1273.575 - 1273.575m : Siderite nodule | | |
| 1273.71 - 1274.94m : Weak to no reaction with HCl, 50% sand, 50% shale intermixed, lams, cross lams within fine sand, moderate bioturbation with the amount of bioturbation descreasing downhole, loading, soft sed deformation, mica rich | 1273.93 - 1273.955m : Salt and pepper coloured fine sand with interbedded lenses of shale, flames, no bioturbation, sharp top and basal contacts | 1273.71 - 1273.78m : 3846 |
| | 1273.955 - 1274.36m : Shale with sandy ripples with cross lams, sharp basal and top contacts | |
| | 1274.36 - 1274.37m : Fine sand with with lams of shale, no biotubation, sharp top and basal contacts | |
| | 1274.37 - 1274.695m : Shale with sandy ripples and cross lams, no biotubation, sharp top and basal contacts | |
| | 1274.695 - 1274.7m : Shale with sand ripples and cross lams, sharp top | 1274.71 - 1274.78m : 3847 |



1274.94 - 1276.17m : No reaction with HCl, mica rich, little bioturbation, 30% sand, 70% shale

1276.17 - 1277.4m : No reaction with HCl, a few fine sandy lams/lenses, dk grey shale, mica rich

1277.4 - 1278.63m : No reaction with HCl

1278.22 - 1278.69m : Interbedded shale lams with very fine sand with cross lams/lams, siderite, bioturbation

1278.63 - 1279.86m : No reaction with HCl, dominantly dk grey shale as rubble, mica rich, silty lenses

1279.86 - 1281.09m : Shales have no reaction with HCl, sands have low to moderate reaction with HCl

1281.09 - 1282.32m : Weak to no reaction with HCl, lenticular bedding, lams and cross lams and lenses of very fine sand (10-15%) intermixed with shale, mica rich, some shells

1274.695 - 1274.7m : Shale with sand ripples and cross lams, sharp top contact

Moderate amount of bioturbation

1275.28m : Sand lam, sharp based

1275.54 - 1275.7m : Mica rich, silty lenses, clay rich shale, loading, cross lams

1275.7 - 1275.74m : Brown/orange siderite

1275.74 - 1276.285m : Weak bioturbation, 20-25% fine to upper very fine sand salt and pepper in colour, dk gray shale, loading, cross lams

1276.285 - 1276.3m : Very fine sand bed

1276.36 - 1276.415m : Shale with very fine sand (beige/gray) lams, disseminated siderite grains

1276.415 - 1276.55m : 30% sand lams, cross lams, with shale, lenticular bedding

1276.55 - 1276.78m : Very fine sand lams, low bioturbation, sharp based sands and shale and siderite are interlaminated

1276.85 - 1276.88m : Mica rich shale, silt lenses, rubble, siderite

1277.13 - 1277.14m : Sand and shale with low bioturbation

1277.14 - 1277.215m : Very fine sand, planolites, siderite, gradational base

1277.215 - 1277.4m : Mica rich shale, silt lenses, very fine sand grains

1277.4 - 1277.515m : Bioturbated sands and shale intermixed

1277.515 - 1274.74m : 50% sand, 50% shale, lams, cross lams

1277.74 - 1277.945m : Shale, very fine sand intermixed, bioturbation, soft sed deformation

1277.93 - 1278.01m : 80% sand with shale lams, cross lams, moderate

1278.01 - 1278.22m : Dk grey shale, rubble, mica rich, black organics

1278.5 - 1278.52m : Abundant bioturbation

1278.58 - 1278.63m : Moderate bioturbation

1278.69 - 1278.7m : Very fine sand, sharp top and base with shale, flames

1278.63 - 1278.67m : Very fine sand lams grade downwards into siderite, sharp based, flames, loading

1278.705 - 1278.735m : Very fine sands grades downwards into siderite and grades downward into shale

1279.05 - 1279.075m : Sharp based sands, laminated

1279.075 - 1279.1m : Shale grades into siderite which grades into very fine sand, sharp based

1279.1 - 1279.24m : Mica rich, dk gray shale, 10% silt lenses, minor very fine sand lams, siderite

1278.87 - 1279.03m : Shale

1279.03 - 1279.05m : Planolites, lenses of sand, cross lams, lams

1279.86 - 1280.47m : Dk gray shale, silty, silt lenses, mica rich, siderite, rubble, black organics

1280.47 - 1280.68m : Gradational top contact (flames, soft. sed), sharp basal contact, upper very fine to fine beige/gray sand, shells

1280.68m : Shale, mica rich, very fine sand lenses, shells, siderite

1274.71 -
1274.78m : 3847

1275.65 - 1275.7m : 3848

1275.7 - 1275.77m : 3849

1276.72 -
1276.78m : 3850

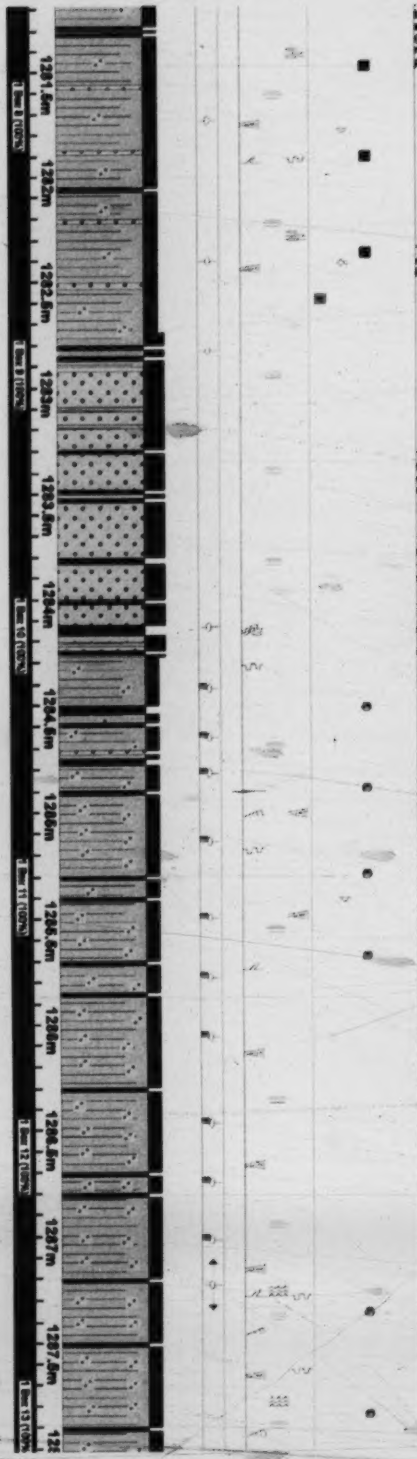
1277.71 -
1277.77m : 3851

1278.69 -
1278.76m : 3852

1279.67 -
1279.74m : 3853

1279.99 -
1280.02m : 3854

1280.67 -
1280.73m : 3855



bedding, lams and cross lams and lenses of very fine sand (10-15%) intermixed with shale, mica rich, some shells, planolites?

1282.32 - 1283.29m : Weak to no reaction with HCl, silty shale, silt lenses, fine intermixed sand

1283.29 - 1283.55m : Strong reaction with HCl, change in colour to lighter white fine sand, siderite

1283.69 - 1283.82m : No reaction with HCl

1283.82 - 1284.06m : Strong reaction with HCl

1284.06 - 1284.17m : No reaction with HCl

1284.17 - 1284.36m : Moderate to weak reaction with HCl

1284.36m : No reaction with HCl

1284.76 - 1286.01m : Mica rich dk gray shale (50%), silt, very fine sand (50%) intermixed, very fine sand lams, no reaction with HCl, loading, siderite, shells

1286.01 - 1287.24m : No reaction with HCl, intermixed very fine sand with shale, 60% sand, 40% shale, cross lams, siderite, bioturbation

1287.24 - 1288.47m : No reaction with HCl, 50% sand, 50% shale, siderite, mica rich, wavy bedding

Sharp based very fine sand lams and lenses downhole, some bioturbation

Loading, flame structures

1282.115 - 1282.125m : Very fine sand lams, sharp tops and bases

1282.4m : Fish fragments

1282.74 - 1282.805m : Fine sand sized lams, fissile shale, siderite

1282.805 - 1282.92m : Upper fine to lower medium sized sand, thin lams of shale, some siderite

1282.92 - 1283.05m : Upper fine to lower medium sand sized with minor siderite, sharp top contact

1283.05 - 1283.29m : Fine sand with minor shale lams and lenses

1283.55 - 1283.69m : Fine sand, sharp based, lams of black organics, strong reaction with HCl

1283.69 - 1283.795m : Fine gray/beige sand with shale lams

1283.795 - 1284.265m : Fine sand with shale lams, siderite, gradational base

1284.12 - 1284.17m : Siderite and soft sed deformation, bioturbation

1284.265 - 1284.5m : 50% sand, 50% shale, gradational top, sharp base, bioturbated, loading, siderite at the top, planolites?

1284.5m : Shale

1284.9 - 1285.1m : Sandy ripples with cross lams

Cross lams, grading from shale downhole to very fine sand

Flames structures

1286.2 - 1286.42m : Gradational contacts between sand and shale

1286.42 - 1286.83m : Sharp contacts between sand and shale

1286.83 - 1287.07m : Gradational contacts between sands and shale

1287.07 - 1287.11m : Sharp based sands

Flame structures, loading

1287.11 - 1287.35m : Bioturbation, gradational contacts between sand and shale

1287.35 - 1287.44m : Very fine sand cross lams and lams, loading, microfault, flame structures, ripples

1281.71 - 1281.77m : 3856

1282.64 - 1282.7m : 3859

1282.84 - 1282.88m : 3858

1283.46 - 1283.55m : 3860

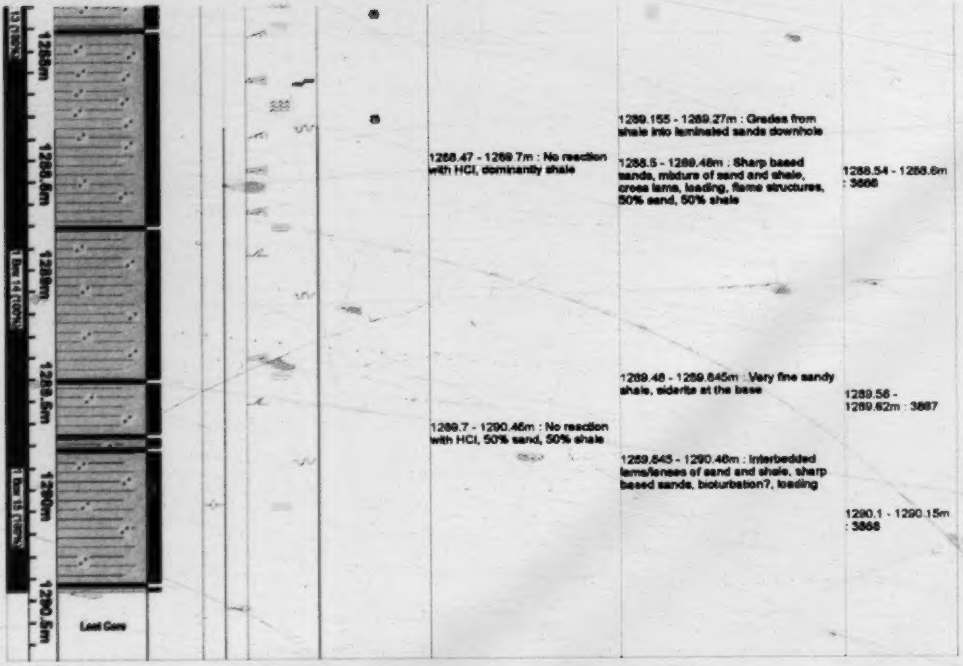
1283.55 - 1283.62m : 3861

1284.69 - 1284.74m : 3862

1285.72 - 1285.79m : 3863

1286.63 - 1286.71m : 3864

1287.61 - 1287.67m : 3865


13 (100%)
1288m
1288.5m
1 Box 14 (100%)
1289m
1289.5m
1 Box 15 (100%)
1290m
1290.5m
Lost Core
1288.47 - 1289.7m : No reaction with HCl, dominantly shale
1289.7 - 1290.46m : No reaction with HCl, 50% sand, 50% shale
1289.155 - 1289.27m : Grades from shale into laminated sands downhole
1288.5 - 1289.48m : Sharp based sands, mixture of sand and shale, cross lams, loading, flame structures, 50% sand, 50% shale
1289.48 - 1289.845m : Very fine sandy shale, siderite at the base
1289.845 - 1290.46m : Interbedded lams/lenses of sand and shale, sharp based sands, bioturbation?, loading
1288.54 - 1288.6m : 3886
1289.56 - 1289.62m : 3887
1290.1 - 1290.15m : 3888

**00/10-09-066-23W5/0: Rax Et Al Ante 10-9-66-23**

*Core*: 1272.48m – 1290.46m

*Second White Specks interval from cross section:* 1106m – 1235m

*Observations:*

The core comprises a dark grey shale, very fine to medium sized sand in laminations, beds and lenses, as well as siderite. Throughout the interval, there is abundant bioturbation, soft sediment deformation and ripples.

*Comments (from the base to the top of the interval):*

The core is found stratigraphically below the Second White Specks interval. This may represent the Belle Fourche Formation or a lower unit. Absolutely no white specks were discovered throughout the whole unit. This core did not look like any other observed cores. It was extremely sandy, and was bioturbated. It also did not react with hydrochloric acid. There was abundant siderite. This appeared to be more typical of the Belle Fourche Formation. The source of the sediment is closer to the area of deposition.

**Well Information**

| | |
|---|---|
| **Operator:** | **Devon Canada Corporation** |
| **Well Name:** | **Anderson Et Al Paradise 10-22-47-3** |
| **Location:** | |
| **UWI:** | 100102204703W400 |
| **Pool:** | Unknown |
| **Field:** | Undefined - Alta (998) |
| **Province / State:** | Alberta |
| **Country:** | Canada |

**Elevations**

| | | | |
|---|---|---|---|
| **Reference:** | | **Ground:** | 650.4 m |
| **Cut(-) / Fill(+):** | | **Kelly Bushing:** | 653.5 m |
| **K.B. to Ground:** | m | **Casing Flange:** | m |

**Surface Co - Ordinates**

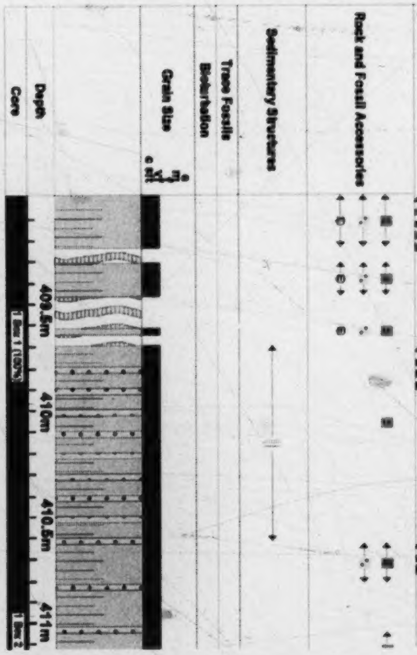
| | |
|---|---|
| **Well Type:** | Straight |
| **Longitude:** | -110.352306 |
| **Latitude:** | 53.070258 |
| **N / S Co - Ordinates:** | 424.4 |
| **E / W Co - Ordinates:** | 426.6 |

**Bottom Hole Co - Ordinates**

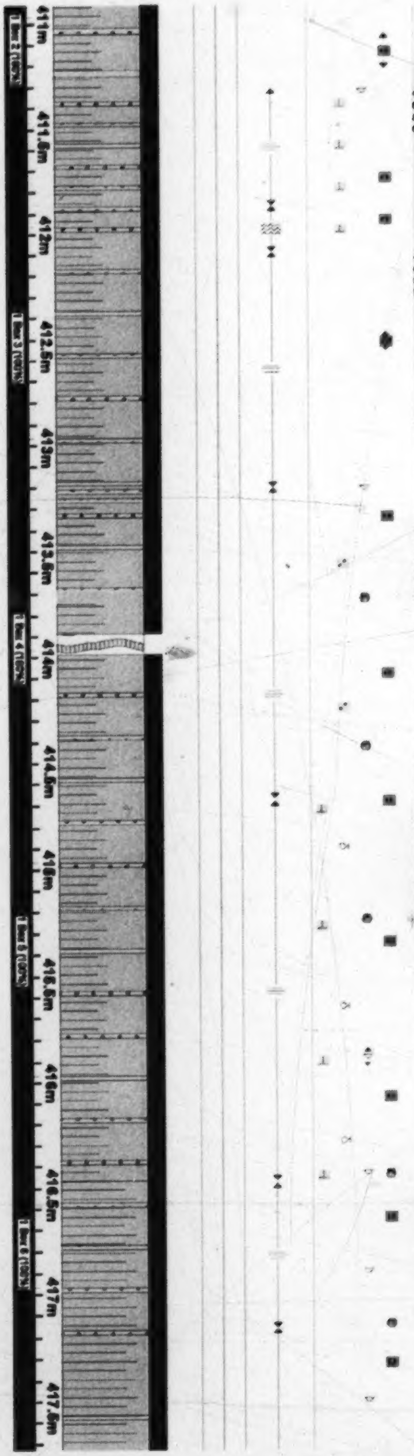
| | |
|---|---|
| **Longitude:** | -110.352306 |
| **Latitude:** | 53.070258 |
| **N / S Co - Ordinates:** | 424.4 |
| **E / W Co - Ordinates:** | 426.6 |

**Well Summary**

| | | | |
|---|---|---|---|
| **Spud Date:** | Nov 18, 1976 | **Contractor:** | |
| **TD Date:** | | **Rig Release Date:** | Nov 25, 1976 |


Core
Depth
Grain Size
c slt vf f m c vc
Bioturbation
Trace Fossils
Sedimentary Structures
Rock and Fossil Accessories
1 Bx 1 (100%)
409.5m
410m
410.5m
411m
1 Bx 2

| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 409.02 - 409.73m: Little to no reaction with HCl, medium grey shale, mica rich, black organics, intermixed very fine sand with the shale | 409.275 - 409.34m : Steel grey bentonite | 409.33 - 409.40m : 6022 |
| | 409.5 - 409.65m : Steel grey bentonite | 409.52 - 409.59m : 6023 |
| 409.73 - 410.65m : Slight reaction with HCl, abundant very fine sand lams, sharp bases and tops, clays to fine silt intermixed | 409.68 - 409.65m : White/grey bentonite with abundant large dark micas | 409.68 - 409.73m : 6024 |
| | | 410.056 - 410.125m : 6025 |
| | | 410.44 - 410.51m : 6026 |
| 410.65 - 411.34m : Weak reaction with HCl, very fine sand intermixed with silt/clays | 410.65 - 411.34m : A few very fine lams/lenses | |



411.34 - 412.12m : Moderate to strong reaction with HCl, abundant sharp based very fine calcareous sandy lams

411.34m : Shelly debris layer

411.46 - 411.55m : 6027

411.75 - 411.82m : 6028

411.9 - 412.12m : Thin, slightly calcareous undulatory very fine sandy lams/lenses (thicken/thin), sharp based

412.12 - 413.23m : Med gray clays/silts with a few very fine sand lams, a few black organics, low reaction to HCl

412.295 - 412.365m : 6029

413.23m : Shelly layer

413.23 - 413.45m : Sand lams increase in abundance, strong reaction with HCl

413.38 - 413.45m : 6030

413.45 - 414.70m : Low to moderate reaction with HCl, thin sand lams (lams/lenses thicken/thin), silt/clays/very fine sand intermixed, very fissile shale, mica rich

413.92 - 414.02m : Bentonite with abundant dark micas

413.92 - 414.02m : 6031

414.415 - 414.485m : 6032

414.70 - 416.50m : Low to no reaction with HCl, some calcareous sandy lams, some non calcareous very fine sandy lams, lams/lenses are sharp based and slightly undulatory in areas up to 1cm in thickness, medium gray shale, very fine sand/silt/clay intermixed, mica rich, fish fragments, shelly debris

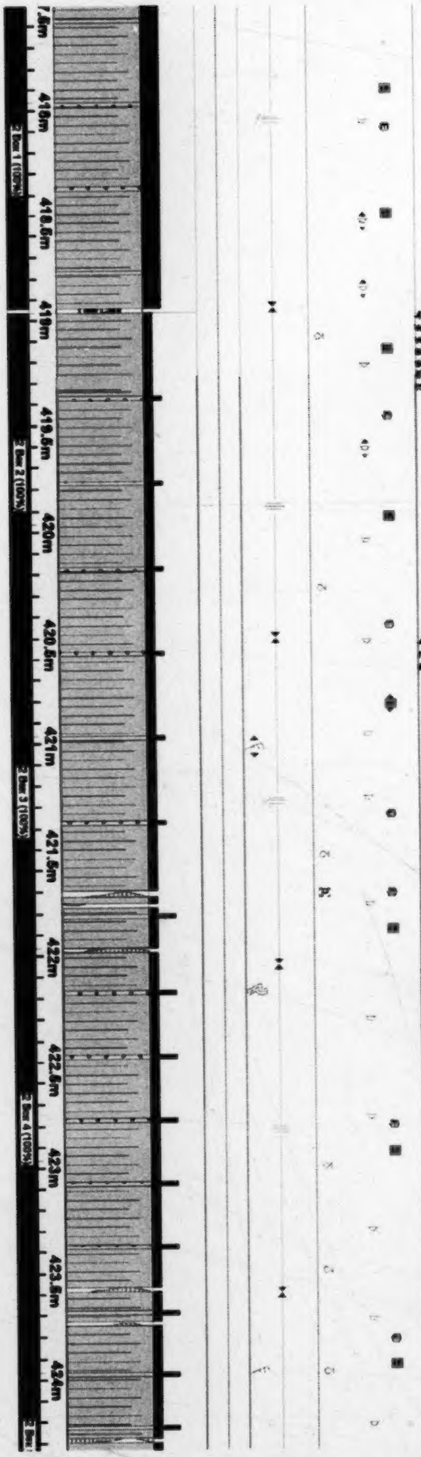
414.99 - 415.05m : 6034

415.34 - 415.41m : 6033

416.32 - 416.39m : 6035

416.50 - 418.96m : Dominantly dark gray shale, silty, some thin very fine sand lams, some shell fragments, some large inoceramus, mica rich, weak to vigorous reaction with HCl

417.33 - 417.40m : 6036



419.00 - 420.54m : No reaction with HCl aside from HCl reacting with the shells, dk grey/black shale with 5-10% silt, fissile, shells and shelly debris, pockets of very fine light grey sand, micas, minor fish debris

420.54 - 422.08m : Weak to no reaction with HCl, very thin lams and lenses

422.08 - 423.62m : No reaction to HCl unless shelly debris is present, number of sand lams increasing downhole, wave reworked shells, lenses of sand thicken and thin

423.62 - 425.16m : Weak to no reaction with HCl, less than 5% silt, some fish debris

Very fine pockets of sand, concentrations of shells

419.8 - 420.4m : Very little silt, only a few thin very fine sand lams

5% silt, few sand lams, areas of bioclastic material

Sand ripple, sand lams are slightly coarser - fine sand

421.31 - 421.69m : Shells increasing in abundance, 3 cm thick shelly layer

0.5 cm thick very fine-fine sand lams

421.73 - 421.74m : Bentonite, sharp based (base is slightly green) with gradational top, disseminated pyrite and micas

421.79m : 1mm thick bentonite

422.00m : 1mm thick bentonite

423.60m : Thin mm bentonites

423.76m : Thin mm bentonites

Sharp based sands, sand ripples and loading

424.31m : 1mm thick bentonite

418.36 - 418.43m : 8037

419.00 - 419.07m : 219

419.96 - 420.05m : 220

420.96 - 421.05m : 221

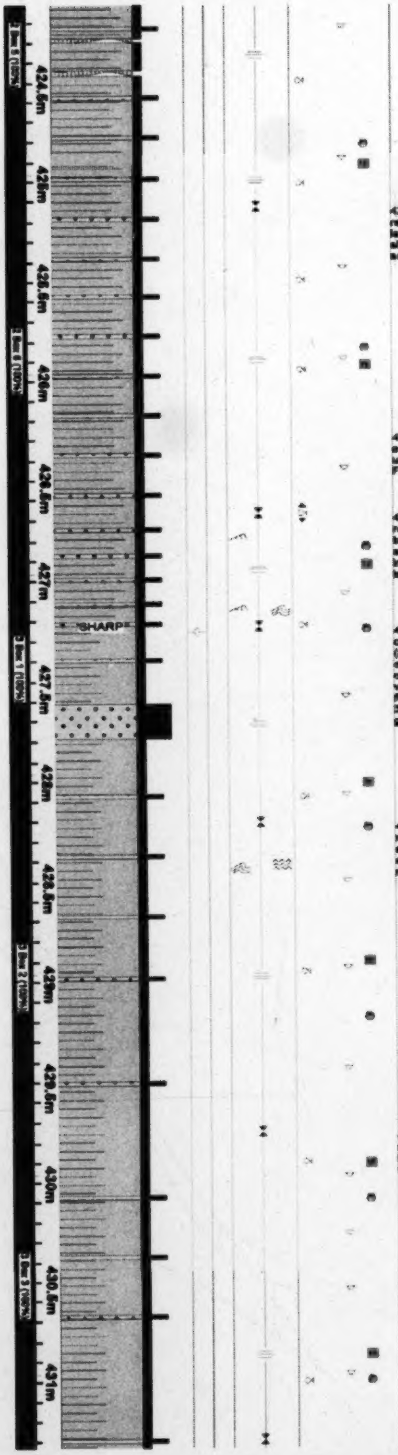
421.56 - 421.58m : 222

421.72 - 421.74m : 223

421.95 - 422.02m : 224

422.95 - 423.02m : 225

423.94 - 424m : 226



425.16 - 426.7m : Little to no reaction with HCl, many sand lams and lenses, abundant shelly debris, less than 5% silt and dominated by fine grains

426.7m : Contact with the overlying shale and the underlying Second White Specks Formation

426.7 - 427.26m : Little to no reaction with HCl, breaking blocky, micas, dk gray/black shale with little silt and fine sand, increasing abundance of sand lams

427.26 - 428.24m : Distinct colour change to medium gray (appears milder than the overlying shale), fissile, first sight of white specks, reacts vigorously with HCl, sharp based fine sand lenses and lams up to 3mm in thickness, sand is light gray/white, some shells

428.24 - 429.78m : Strong reaction with HCl, fissile, abundant white specks, abudent shells, shale has minor silt, micas

429.78 - 431.32m : Strong reaction with HCl, shale with very little silt, shells lign up with fissility

431.32 - 432.8m : Strong

424.31m : 1mm thick bentonite

424.47 - 424.485m : 1.5 cm thick steel gray bentonite, interlaminated shale

Shelly debris, abundant sand lams and lenses, micas

Some lams thicken and thin, most are sharp based, some shelly debris layers

426.85m : Fine sand with abundant fish debris and black organics

Sand ripples with cross lams, sharp undulatory bases, loading, increasing sand lams to 427.26, shelly debris, fish/black organic matter

427.26m : Abrupt contact between overlying dk gray shale with abundant sand lams and underlying med gray shale with less sand lams and start of visible white specks, concentration of micas/fish debris/fine sand/bioturbation at the contact

427.26 - 427.65m : Very little silt in shale, undulatory and sharp based sands, white specks becoming abundant

427.65m : Large shell

427.65 - 427.815m : Sand unit composed of very fine sand with lams of fine/medium sand that is gradational

Some sand lams up to 1 cm in thickness, sharp bases and gradational tops

Sandy lams often contain sand sized particles of fish debris/black organic matter/shelly debris

428.4 - 428.6m : Loading and deformation of sand lams

429 - 430.1m : Fewer sand sized particles, sand lams are only clearly visible when wet, concentrations of white specks? some lams are silt sized

430.10 - 430.75m : Increase in number of shells, sand lams thicken and thin

430.75 - 431.32m : Very little sand lams and shelly debris, dominated by shale with little silt

431.32 - 432.02m : Shells increasing in

424.455 - 424.475m : 227

424.94 - 425.01m : 228

425.97 - 426.04m : 229

426.43 - 426.50m : 3987

427.00 - 427.06m : 230

427.64 - 427.72m : 231

427.85 - 427.92m : 232

428.24 - 428.31m : 3988

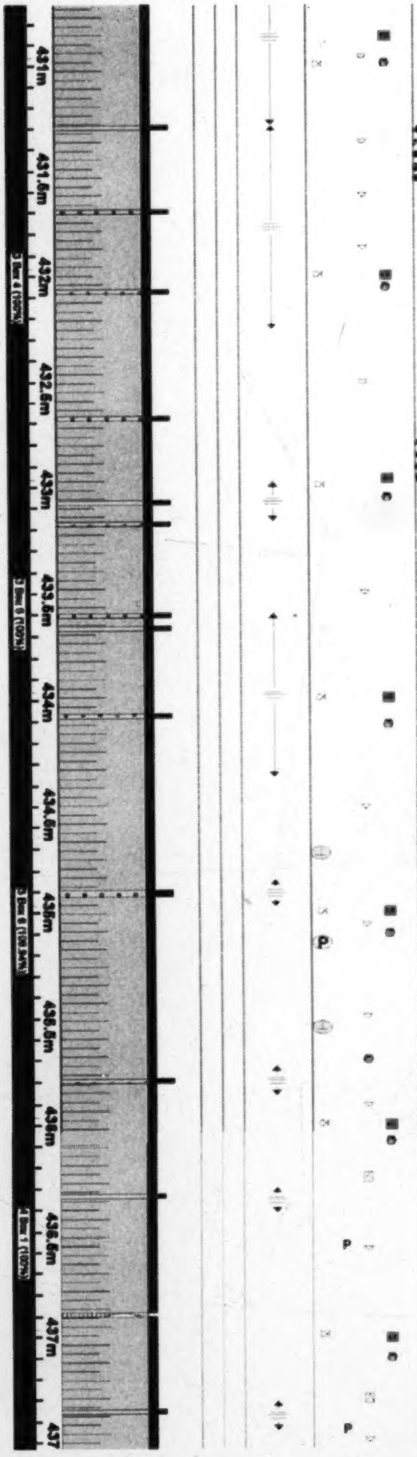
429.07 - 429.14m : 233

430.08 - 430.15m : 234

430.36 - 430.42m : 235

430.48 - 430.51m : 3991

431.03 - 431.10m : 236



431.32 - 432.8m : Strong reaction with HCl, slightly siltier shale (less than 5% silt), coarse grains are sand sized white specks

432.8 - 434.4m : Strong reaction with HCl, slightly silty shale, abundant shells, fish debris on broken surfaces

434.4 - 435.84m : Strong reaction with HCl, fissile, shale with little silt, white specks present, a few calcitic nodules, shelly debris increasing in abundance down hole

435.84 - 437.38m : Fissile shale with less than 5% silt, strong reaction with HCl, bentonite, a few shells, fish debris, quartz grains, a few white specks

437.38 - 438.92m : Reacts vigorously with HCl, fissile, med gray shale, a few white specks,

430.75 - 431.32m : Very little sand lams and shelly debris, dominated by shale with little silt

431.32 - 432.02m : Shells increasing in abundance and have been reworked, few sand lams

432.02m : Some shelly debris with sand and fish debris (concentrated by currents?), amount of shelly sand debris is decreasing

432.39 - 433.1m : Little to no sand or shells, med gray shale

433.1 - 433.2m : Abundant very fine/fine sand lams, sharp based, white with concentrations of white specks

433.2 - 433.63m : Med gray shale with concentrated lams of white specks

433.63 - 433.71m : A few thicker lams

433.71 - 434.4m : Very few shells, very few sand lams, dominated by shale

435.17m : 1mm sized pyrite nodule

436.1 - 436.1m : Concentrated organic debris in lams, very few sand lams - gradational, very fine sand and silt

436.59m : Shelly debris layer with pyrite

436.92m : 0.5 cm steel gray bentonite, sharp base, green top

437.5m : Bioclastic layers

431.03 - 431.10m : 236

431.99 - 432.06m : 237

433.01 - 433.08m : 238

434.05 - 434.12m : 239

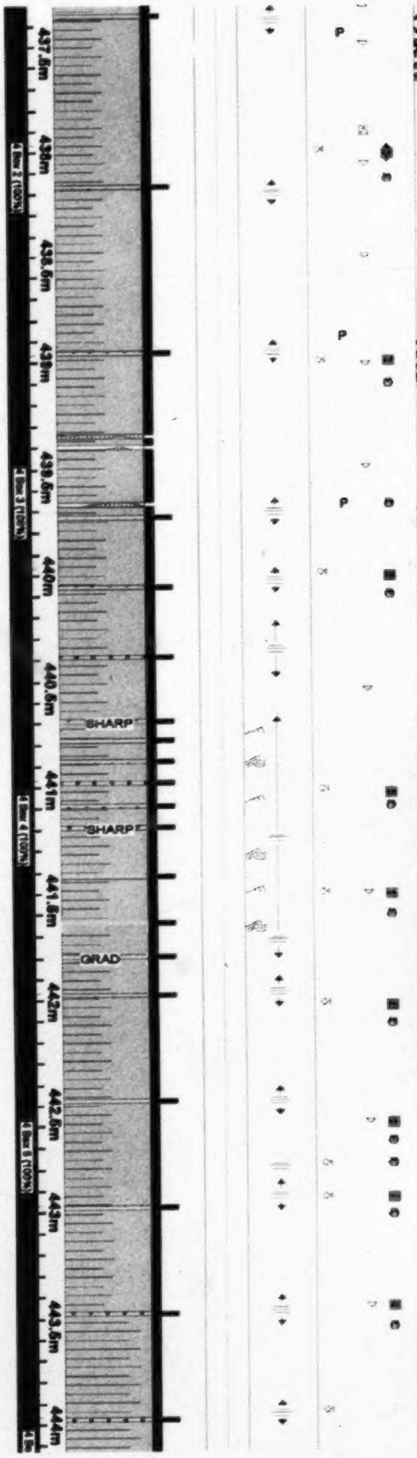
435.02 - 435.085m : 240

436.14 - 436.21m : 241

436.67 - 436.74m : 243

437.05 - 437.12m : 242

437.455 - 437.525m : 244



437.38 - 438.92m : Reacts vigorously with HCl, fissile, med gray shale, a few white specks, fine sand sized lams, micas, disseminated py? Less than 1%, fish debris, shells

438.92 - 440.46m : Strong to moderate reaction with HCl, some silt, shale slightly darker, fish debris, shells

439.7m : Shale breaking more blocky, less fissile

440.415m : Contact between the overlying Second White Specks Formation and the underlying Belle Fourche Formation

440.46 - 442.00m : Moderate to no reaction with HCl

440.73 - 441.23m : Sharp contact at top between overlying shale and underlying shale and sand, ripples with cross lams (low angle), fish debris - especially in sandy lams, shale with abundant fine/very fine sand lams, micas, organic matter, large concentration of micas

441.23 - 441.84m : Sharp top contact between the overlying shale with abundant sand and the underlying shale with minor sand lams, thin mm thick lams, some fish debris, a few ripples and deformation

441.84 - 443.54m : Upper contact is gradational as lams of sand decrease downhole, silty and very fine sandy mm thick lams, a little fish debris and small mm thick shells, pieces are broken and chipped in the box, little to no reaction with HCl, mica rich, conchoidal fracture, white specks are sparse

443.54 - 445.08m : Weak to no reaction with HCl, dominated by dark gray shale, fissile and broken within box, conchoidal fracture, little to no silt, micas, a few sandy lams, some shells and fish debris

437.5m : Bioclastic layers

Shale with small amount of silt and occassional sandy pocket

439.37 - 439.37m : Possible 1mm thick bentonite

439.415 - 439.425m : 1cm steel grey bentonite, some orange/red discolouration at base, contacts not visible

Shelly layers

439.69 - 439.71m : 2cm steel grey bentonite (hard, altered?, silicified?), dk micas, encrusted with pyrite

439.88m : Distinct sand lams, increasing in occurence downhole

440.3m : Silt concentration increasing downhole, rock "sparkles" due to large number of micas

442.8 - 442.805m : Thicker white very fine sand lam with micas and black particles

437.455 - 437.525m : 244

438.35 - 438.41m : 245

439.48 - 439.55m : 246

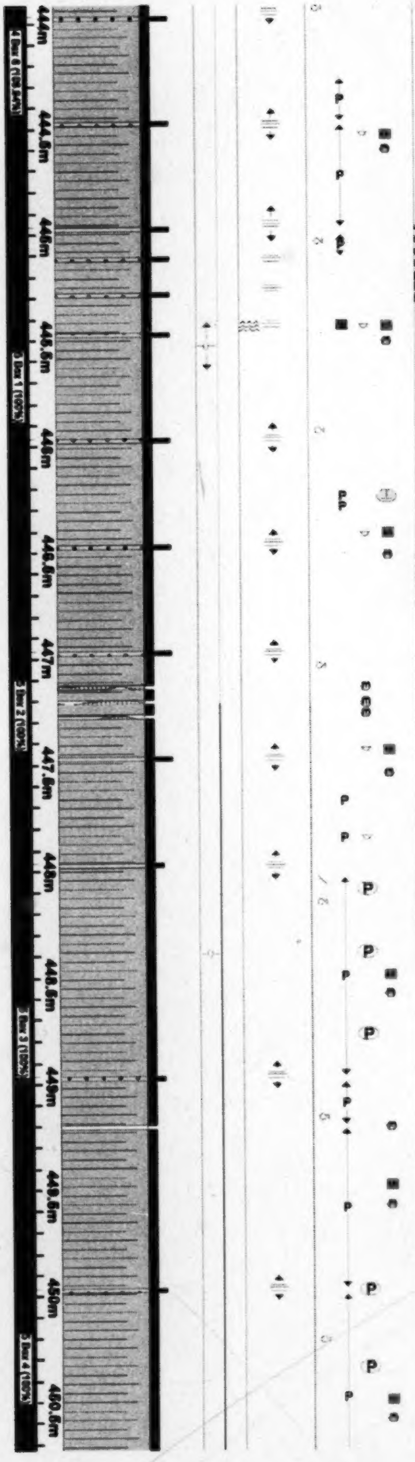
440.46 - 440.53m : 247

441.16 - 441.23m : 248

441.44 - 441.51m : 249

442.45 - 442.51m : 250

443.47 - 443.52m : 251



444.98 - 444.3m : Minor fine sandy lams, dominantly clay sized particles, only a few white specks, abundant micas - particularly concentrated in sand lams and lenses, possible burrows, fish debris, shells

446.53 - 448.07m : No reaction with HCl, no white specks, fissile, abundant micas, minor very fine sand lams, fish debris, 1mm sized shells

448.07 - 449.6m : Little to no reaction with HCl, mica rich, some very fine sandy lams, mineralized (pyrite less than 1%), fish debris

449.6 - 451.15m : Weak to no reaction with HCl, mica rich, black organic fragments, fish debris, disseminated pyrite

444.3m : Disseminated pyrite within shale, some surfaces of shale are slightly discoloured brown/red

Patches of red/brown colouration on shale, sand lams becoming less abundant down hole

445.44m : Undulatory sand lams, some sand sized lams are green coloured - glauconite?, black organics

446.27m : Disseminated py, calcareous concretion (round)

446.3m : Lenses of sand concentrated with pyrite

447.16 - 447.3m : 2 or 3 green/grey bentonites (competent, may be silicified), micas

447.7m : Disseminated pyrite

447.87m : Shelly material had been mineralized

448.08m : Mineralization in fractures

448.1m : Disseminated pyrite, black organics

448.12m : Pyrite nodule

448.4m : Pyrite nodules, pyrite infilling burrows?

448.53m : Area is red/brown coloured (burnt looking), with disseminated pyrite, sand lenses filled with pyrite

448.8m : Pyrite nodules, pyrite especially concentrated in sand lenses/lams, disseminated pyrite in shale

449.00m : Shale with little to no silt, a few sandy lenses

449.24m : Altered bentonite - full of micas and pyrite, red/brown halo

450.00m : Small (mm sized) pyrite nodules

450.355m : Pyrite nodules

444.47 - 444.54m : 252

445.14 - 445.15m : 254

445.38 - 445.44m : 253

446.39 - 446.45m : 255

447.27 - 447.3m : 256

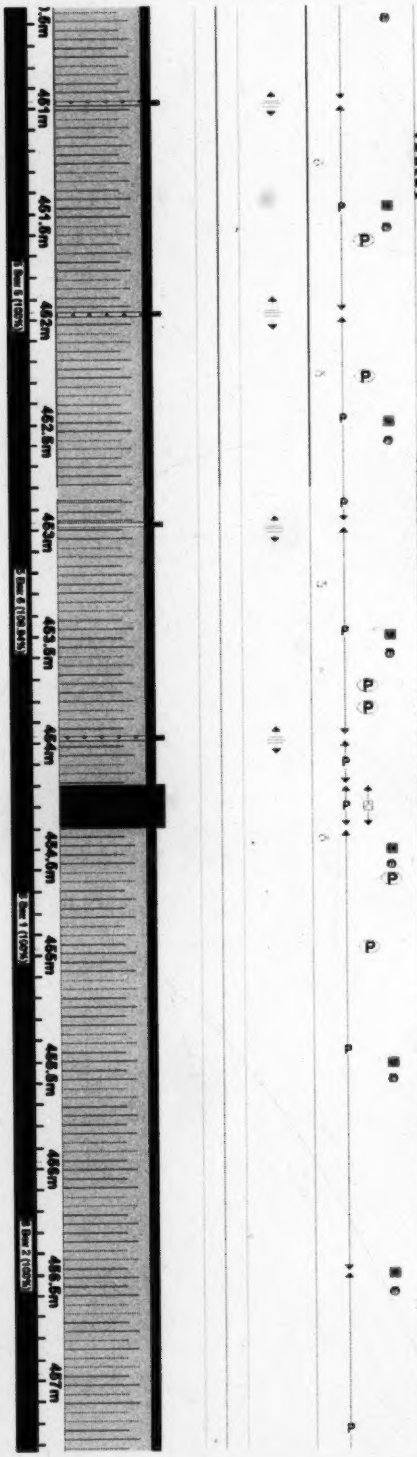
447.4 - 447.45m : 257

448.36 - 448.42m : 258

449.2 - 449.24m : 259

449.41 - 449.46m : 260

450.38 - 450.45m : 261



451.15 - 452.69m : No reaction to HCl, dominated by massive dk gray shale, conchoidal fracture, no white specks are visible, very fine grained, dominated by clays with less than 5% silt

452.69 - 454.13m : Weak reaction with HCl, reaction increases to the base of the box, dk gray shale, smooth - little to no silt, mica rich, pyrite nodules and disseminated pyrite

454.13 - 455.67m : Weak to no reaction with HCl, pyrite nodules, fine shale, little silt, no specks apparent, some organic remains

455.67 - 457.21m : Weak reaction with HCl, abundant micas, small amounts of pyrite, little silt, massive dk gray shale

457.21 - 458.75m : Weak to no reaction with HCl, micas, a few pyrite nodules, disseminated

451.02 - 451.17m : 1.5 cm pyrite rich silty lam

451.65 - 451.655m : 0.5cm pyritized nodules

452.3m : Pyrite nodules (perhaps infilling burrows?)

453.76 - 453.78m : Thick, heavy, heavily pyritized lam, hard, (altered?), green coloured, fine grains

453.88m : Pyritized section, red/brown/black halo, disseminated pyrite

454.23 - 454.43m : Very heavy horizon, sharp contacts at the top and the base, on broken surfaces large quartz and pyrite crystals can be seen, hard, from top to base of the horizon are orange, red, beige, red, orange colourations

457.21m : Red/brown halo

450.99 - 451.03m : 262

451.39 - 451.45m : 263

451.73 - 451.74m : 264

452.44 - 452.51m : 265

453.44 - 453.51m : 266

454.2 - 454.24m : 269

454.24 - 454.43m : 270

454.42 - 454.48m : 268

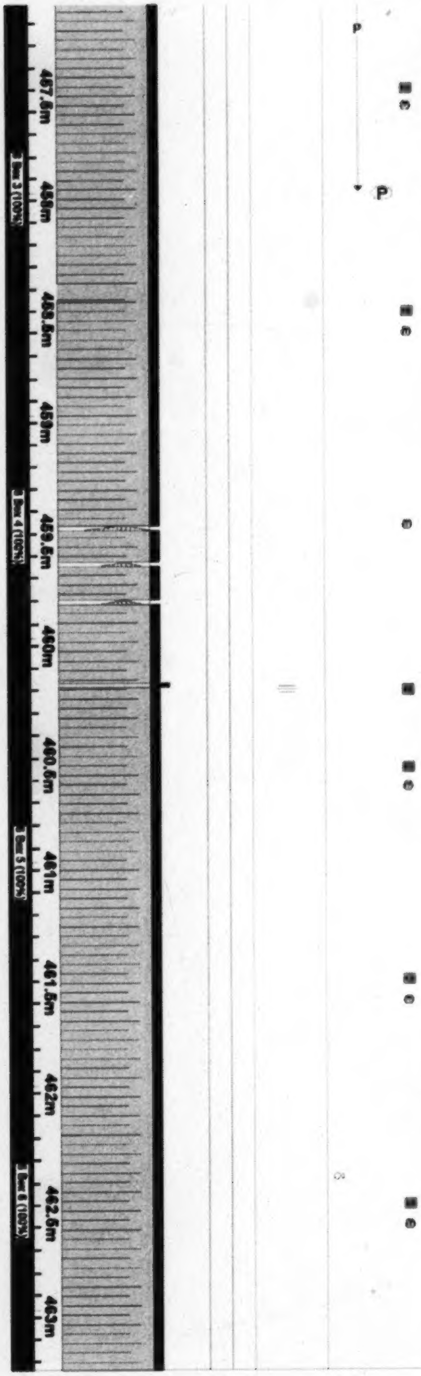
454.43 - 454.49m : 271

454.83 - 454.9m : 272

453.44 - 453.785m : 267

455.81 - 455.88m : 273

456.78 - 456.85m : 274


P
P
457.5m
458m
458.5m
459m
459.5m
460m
460.5m
461m
461.5m
462m
462.5m
463m
Box 3 (100%)
Box 4 (100%)
Box 5 (100%)
Box 6 (100%)

457.21 - 458.75m : Weak to no reaction with HCl, micas, a few pyrite nodules, disseminated pyrite, no coarser grains observed, no white specks observed, massive shale with less than 5% silt

458.75 - 460.25m : Very stong reaction with HCl, fine grained, less than 1% silt, broken fragments of shale, fissile

460.25 - 461.75m : Strong reaction with HCl, dominantly dk gray shale, fissile, mica rich, a few silt lenses

461.75 - 463.27m : Low reaction with HCl, dominantly dk gray shale, a few silt lams, dominantly clay sized grains, mica rich, some fish debris

457.21m : Red/brown halo

459.5 - 459.83m : White, smooth bentonites (?), interdispersed with shales

460.2m : Some silt, less than 5%, very fine sand lams

457.77 - 457.84m : 275

459.43 - 459.5m : 6038

459.5 - 459.83m : 6039

458.68 - 458.75m : 276

460.15 - 460.25m : 6040

460.25 - 460.32m : 6041

460.48 - 460.55m : 6042

461.50 - 461.57m 6043

462.50 - 462.57m : 6044

## Well Information

**Operator:** Home Oil Company Limited
**Well Name:** Hol Taurvs Fir 10-28-59-20
**Location:**
**UWI:** 100102805920W500
**Pool:** Unknown
**Field:** Fir (379)
**Province / State:** Alberta
**Country:** Canada

## Elevations

**Reference:**
**Cut(-) / Fill(+):**
**K.B. to Ground:** m
**Ground:** 1019.6 m
**Kelly Bushing:** 1024.1 m
**Casing Flange:** m

## Surface Co - Ordinates

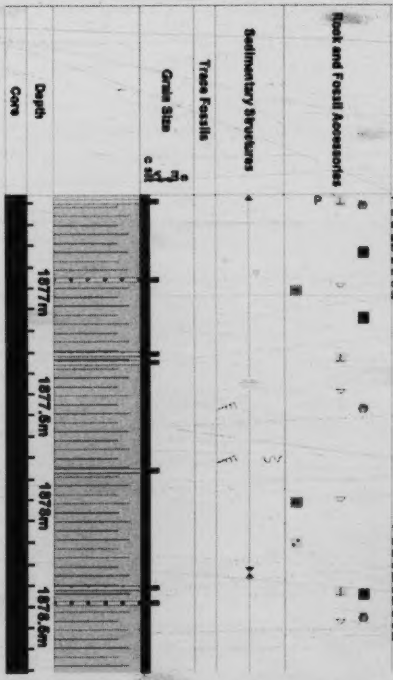
**Well Type:** Straight
**Longitude:** -116.932429
**Latitude:** 54.133561
**N / S Co - Ordinates:** 460.8
**E / W Co - Ordinates:** 478.9

## Bottom Hole Co - Ordinates

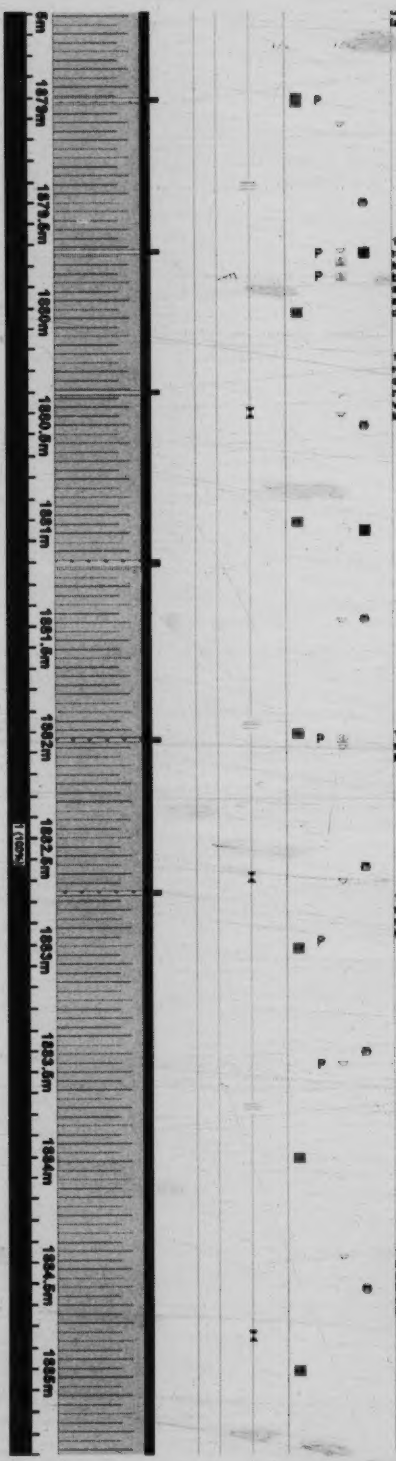
**Longitude:** -116.932429
**Latitude:** 54.133561
**N / S Co - Ordinates:** 460.8
**E / W Co - Ordinates:** 478.9

## Well Summary

**Spud Date:** Jan 14, 1974
**Contractor:**
**TD Date:**
**Rig Release Date:** Jan 24, 1974



| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 1876.56 - 1878.11m : Strong reaction with HCl (particular lams are more reactive with HCl), dk grey shale, fissile, clays with 5-10% silt, sharp based very fine sand sized calcareous lams, mica rich, large and small shells, disseminated pyrite in many lams, discontinuous lams of silt | 1876.58m : 2mm thick very fine calcareous lam with disseminated pyrite | |
| | Brown/red specks (siderite?) | 1876.82 - 1876.87m : 3627 |
| | 1876.88m : Brown specks (siderite?), fish fragments | |
| | 1877.13m : Brown/red specks (siderite?), shelly lam | 1877.13 - 1877.18m : 3628 |
| | 1877.3m : Calcareous lams with sharp bases, gradational tops | 1877.28 - 1877.33m : 3629 |
| | | 1877.41 - 1877.48m : 3630 |
| | 1877.46m : Thin shelly debris layer | |
| | 1877.55m : Small ripple with cross lams | |
| | 1877.8m : Loading, ripples | |
| 1878.11 - 1879.96m : Strong reaction with HCl (some lams react more vigorously than others), dk grey shale, fissile, lams less abundant than overlying core, some shell fragments, Inoceramus, discontinuous silt lams, disseminated pyrite in some lams | 1878.185m : Fine sand lenses | |
| | Abundant thin calcareous lams with lams of red/brown specks (siderite?) | 1878.35 - 1878.42m : 3631 |



disseminated pyrite of some lams

1879.86 - 1880.21m : Strong reaction with HCl, mica rich, silt lenses and lams, abundant brown/red specks (siderite?), some shells, concentration of shells and lams decreasing downhole

1880.21 - 1881.99m : Strong reaction with HCl, mica rich, dominantly clays, minor silt, red/brown specks (siderite?), very fine sand/silt calcareous lams, some shells

1881.99 - 1882.76m : Weak reaction with HCl, silty lenses, a few shells, dk gray shale

1882.76 - 1884.43m : Moderate reaction with HCl, dk gray shale, shells, abundant Inoceramus imprints, some silty lenses

1884.43 - 1885.99m : Weak to moderate reaction with HCl, shells, Inoceramus imprints, lams are dominated by clay and minor silt lenses, mica rich, a few black organics

Shell fragments

1879.72m : Quartz grains, orange colouration, concentration of shells and red/brown specks (siderite?) and pyrite
1879.77m : Calcareous lam

1879.84m : Calcareous lam with disseminated pyrite, ripples

1882.03m : Very fine calcareous lam with disseminated pyrite

1882.05m : Shelly layer

1882.05 - 1882.7m : Rubble with a large Inoceramus at the base

1882.96m : Concentrated pyrite

1883.56m : Large Inoceramus imprint, partially pyritized

White specks?

1879.39 - 1879.46m : 3832

1880.37 - 1880.44m : 3833

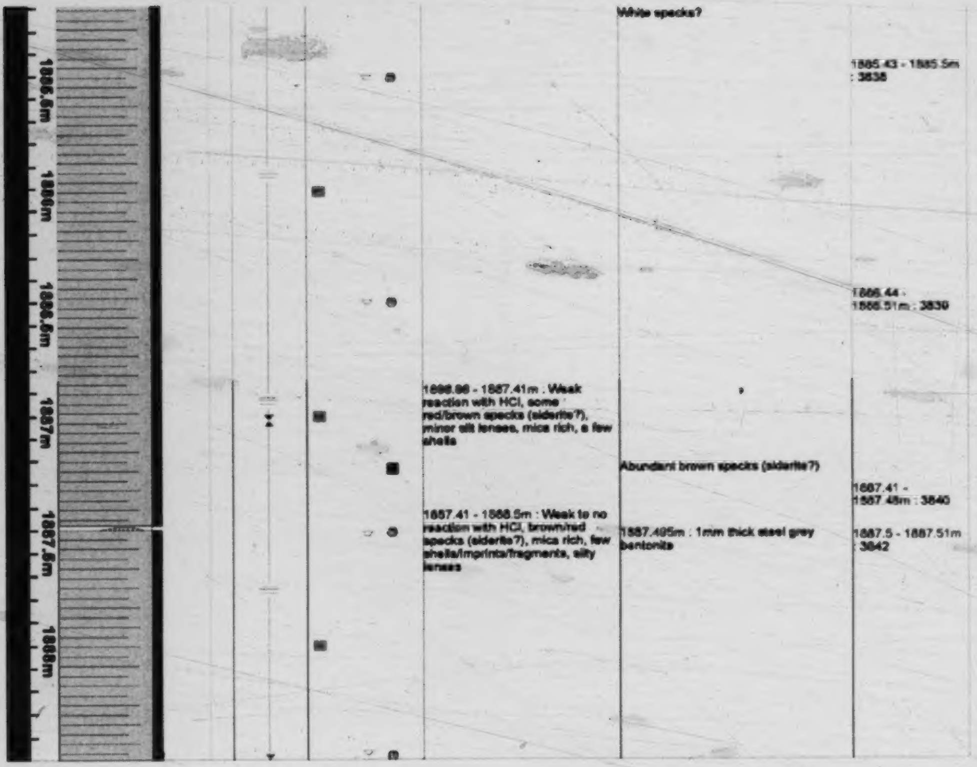
1880.44 - 1880.5m : 3841

1881.38 - 1881.46m : 3834

1882.42 - 1882.48m : 3835

1883.45 - 1883.52m : 3836

1884.45 - 1884.49m : 3837



White specks?

1885.43 - 1885.5m : 3838

1886.44 - 1886.51m : 3839

1886.86 - 1887.41m : Weak reaction with HCl, some red/brown specks (siderite?), minor silt lenses, mica rich, a few shells

Abundant brown specks (siderite?)

1887.41 - 1887.48m : 3840

1887.41 - 1888.5m : Weak to no reaction with HCl, brown/red specks (siderite?), mica rich, few shells/imprints/fragments, silty lenses

1887.495m : 1mm thick steel grey bentonite

1887.5 - 1887.51m : 3842

## Well Information

**Operator:** Murphy Canada Exploration Company
**Well Name:** APL Et Al Pine 10-31-54-18
**Location:**
**UWI:** 100103105418W500
**Pool:** Cardium, 2WPSK, U Mann M... (177660)
**Field:** Pine Creek (706)
**Province / State:** Alberta
**Country:** Canada

## Elevations

**Reference:**
**Cut(-) / Fill(+):**
**K.B. to Ground:** m
**Ground:** 1016.7 m
**Kelly Bushing:** 1020.8 m
**Casing Flange:** m

## Surface Co - Ordinates

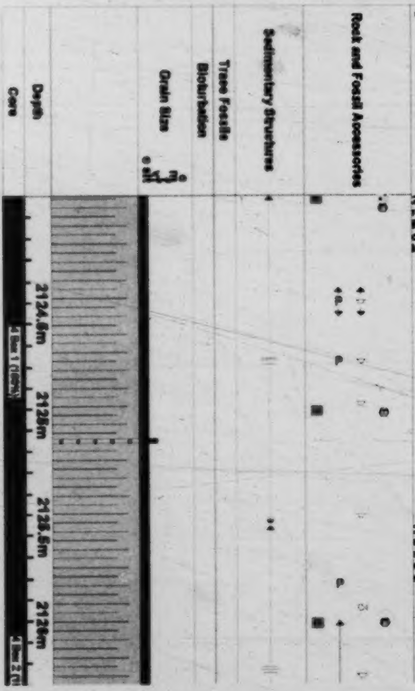
**Well Type:** Straight
**Longitude:** -116.636386
**Latitude:** 53.711393
**N / S Co - Ordinates:** 458.7
**E / W Co - Ordinates:** 490.3

## Bottom Hole Co - Ordinates

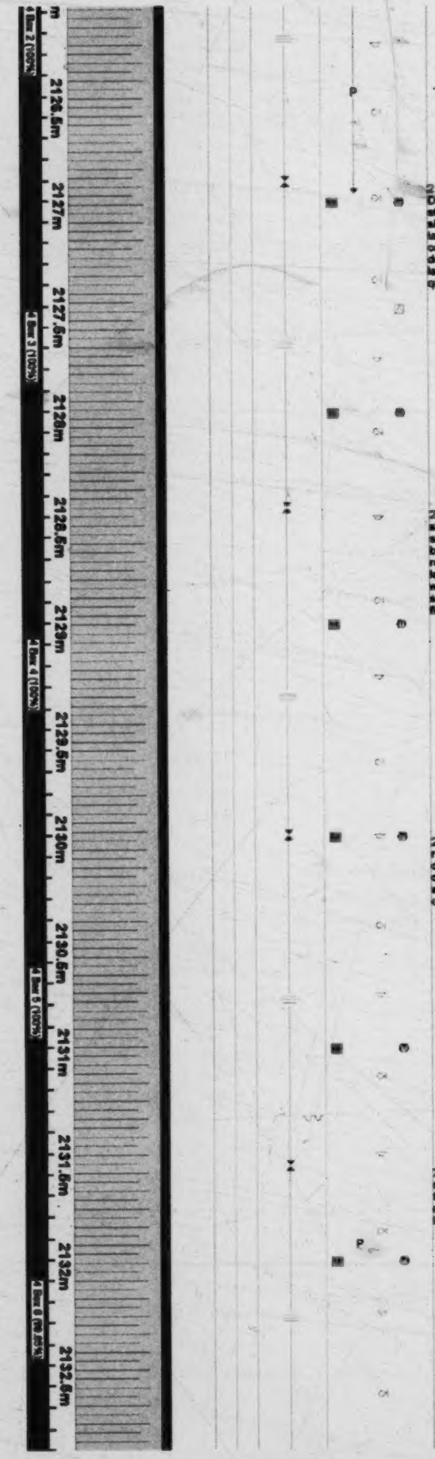
**Longitude:** -116.636386
**Latitude:** 53.711393
**N / S Co - Ordinates:** 458.7
**E / W Co - Ordinates:** 490.3

## Well Summary

**Spud Date:** Jan 3, 1981
**Contractor:**
**TD Date:**
**Rig Release Date:** Feb 3, 1981



| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 2124 - 2125.55m : Moderate reaction with HCl, dk gray shale, fissile, mica rich, dominantly clays, minor silt - discontinuous lenses and lams, many shells | 2124 - 2124.035m : Gray clast, upper very fine grained sands | |
| | 2124.43 - 2124.57m : Pyritized shelly debris, disseminated pyrite | 2124.51 - 2124.56m : 377 |
| | 2124.774m : Large pyritized shell, many smaller pyritized shells | |
| | Abundent shells | |
| | 2125.145 - 2125.145m : 1mm thick upper very fine sand lam | |
| | | 2125.49 - 2125.53m : 378 |
| 2125.55 - 2126.915m : Moderate reaction with HCl, some orange and red specks, silty discontinuous lenses, fish debris, abundant shells | Disseminated pyrite | |
| | 2126.015m : <0.5% disseminated pyrite, pyritized shells | |



pyrite, pyritized shells

2126.46 -
2126.52m : 379

2126.915 - 2128.465m : Dominantly shale, moderate to strong reaction with HCl, a few silty discontinuous lenses and lams, mica rich, specks are coloured orange/red, shells, dominated by fish debris (many layers of fish debris), some quartz grains

2126.985m : Fish debris, coloured specks layer

2127.69 -
2127.75m : 380

2128.465 - 2130.015m : Dk grey shale, discontinuous lenses of silt - beige/white in colour, breaking along fissility, strong reaction with HCl - some laminations react more strongly with HCl than others, abundant shells and shelly debris, some fish debris, mica rich

2128.67 -
2128.73m : 381

2129.1m : Some silt lams and lenses are distorted

2129.65m : Fish debris layer

2129.7 - 2129.75m
: 382

Abundant organic debris layers

2130.015 - 2131.565m : Strong reaction with HCl, dk grey shale, dominantly clay sized, a few discontinuous silty lams, abundant shells, minor fish debris, mica rich

2130.72 -
2130.79m : 383

2131.33m : Some silty lams, sharp based, minor loading

2131.565 - 2133m : Moderate to strong reaction with HCl, some fish debris, some shells, mica rich, discontinuous silty lams and lenses

2131.7m : Silty discontinuous lenses and lams, increasing in abundance downhole

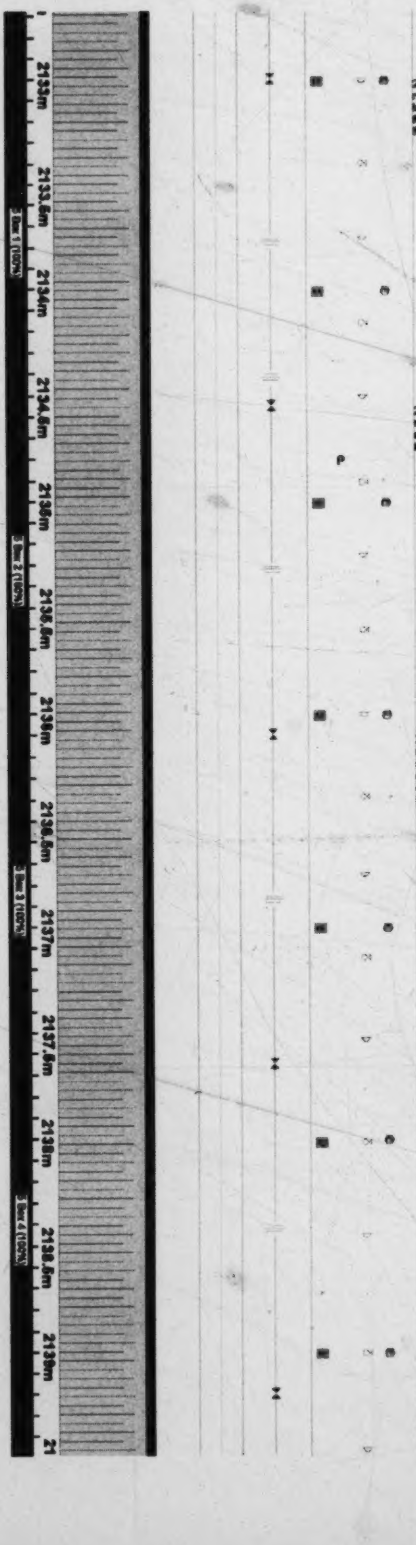
2131.8 - 2131.85m
: 384

2131.92m : Up to 3mm thick lenses of silt filled with disseminated pyrite

2131.91 -
2132.98m : 4516

2132.59 -
2132.65m : 385

Abundant shells


2133m
2133.5m
Box 1 (100%)
2134m
2134.5m
2135m
Box 2 (100%)
2135.5m
2136m
2136.5m
Box 3 (100%)
2137m
2137.5m
2138m
Box 4 (100%)
2138.5m
2139m
21
P

Abundant shells

2133 - 2134.55m : Weak to no reaction with HCl, sparse silty lams and discontinuous lenses, fissile, some silt <3%, mica rich, fish fragments

Reaction with HCl decreases, silt lams decrease downhole, abundance of organic remains decrease downhole

2133.56 - 2133.61m : 386

2134.55 - 2136.1m : Weak to no reaction with HCl, fish debris, shelly debris, discontinuous silt lenses and lams, fissile

2134.55 - 2134.6m : 387

2134.6m : <0.5% pyrite

2135.56 - 2135.61m : 388

2136.1 - 2137.65m : Weak to no reaction with HCl, some shells, some fish debris - abundant organic matter, mica rich, discontinuous silt lams and lenses

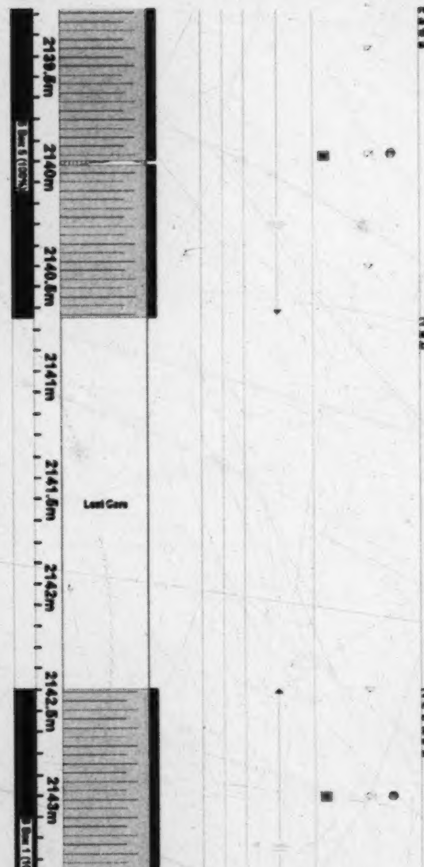
2136.63 - 2136.68m : 389

2137.55 - 2137.61m : 390

2137.65 - 2139.2m : Weak reaction with HCl, some shells and shelly debris, dk gray shale with a few discontinuous silt lams and lenses, fish debris, fissile, mica rich

2138.56 - 2138.62m : 391

2139.2 - 2140.75m : Strong reaction with HCl, dk gray shale, some shells, minor fish debris, discontinuous lams and lenses of silt


2139.5m
2140m
2140.5m
2141m
2141.5m
2142m
2142.5m
2143m
2143.5m
2144m
2144.5m
2145m
2145.5m
2146m
Box 5 (100%)
Box 1 (100%)
Box 2 (100%)
Lost Core

reaction with HCl, dk gray shale, some shells, minor fish debris, discontinuous lams and lenses of silt

2139.57 - 2139.64m : 392

2140.045m : Thin, gray/green bentonite

2140.61 - 2140.65m : 393

2140.75 - 2142.5m : Lost core, added arbitrarily to the end of the boxes

2142.5 - 2144.05m : Weak to moderate reaction with HCl, orange/brown specks, fissile and platey, some shells, fish debris, discontinuous lams and lenses of silt, mica rich

2142.6 - 2142.64m : 394

2143.34 - 2143.38m : 395

2144.05 - 2145.6m : Weak to moderate reaction with HCl, generally fissile, dk gray shale, discontinuous lenses of silt, dominantly clays, mica rich, fish debris, shells, orange/red specks

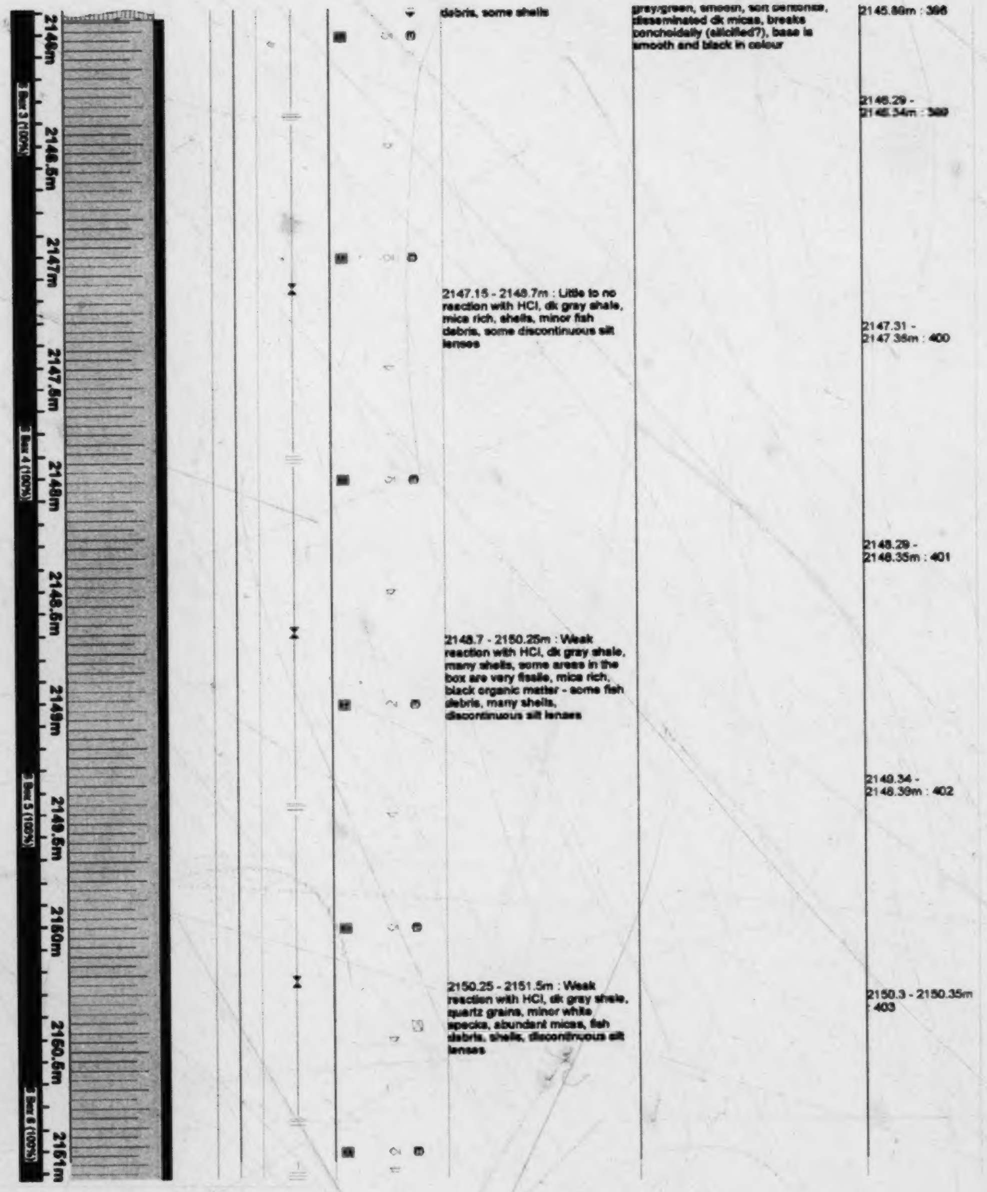
2144.35 - 2144.39m : 396

2144.44 - 2144.51m : 4319

2145.6 - 2147.15m : Weak reaction with HCl, dk gray shale, bentonite, few discontinuous lenses of silt easily seen on broken surfaces, some fish debris, some shells

2145.81 - 2145.93m : Thick, gray/green, smooth, soft bentonite, disseminated dk micas, breaks conchoidally (silicified?), base is smooth and black in colour

2145.93 - 2145.98m : 398


2146m
Box 3 (100%)
2146.5m
2147m
2147.5m
Box 4 (100%)
2148m
2148.5m
2149m
Box 5 (100%)
2149.5m
2150m
2150.5m
Box 6 (100%)
2151m

debris, some shells

gray/green, smooth, soft bentonite, disseminated dk micas, breaks conchoidally (silicified?), base is smooth and black in colour

2145.88m : 398

2146.29 - 2146.34m : 399

2147.15 - 2148.7m : Little to no reaction with HCl, dk gray shale, mica rich, shells, minor fish debris, some discontinuous silt lenses

2147.31 - 2147.36m : 400

2148.29 - 2148.35m : 401

2148.7 - 2150.25m : Weak reaction with HCl, dk gray shale, many shells, some areas in the box are very fissile, mica rich, black organic matter - some fish debris, many shells, discontinuous silt lenses

2149.34 - 2149.39m : 402

2150.25 - 2151.5m : Weak reaction with HCl, dk gray shale, quartz grains, minor white specks, abundant micas, fish debris, shells, discontinuous silt lenses

2150.3 - 2150.35m : 403

**00/10-31-054-18W5/0: APL Et Al Pine 10-31-54-18**

*Core:* 2124m – 2151.5m

*Second White Specks interval from cross section:* 2037m – 2075m

*Observations:*

The core is fairly homogeneous, dark grey in colour, dominated by clays with minor silt. There is abundant fish and shelly debris, along with a thick bentonite at 2145.6m depth.

*Interpretation:*

The core does not lie within the Second White Specks Formation interval. The core is stratigraphically lower than the interval. It may represent the Belle Fourche Formation, or an older formation. No micropaleontology or palynology samples were sent for this core, therefore, the picks are based on stratigraphical correlations. The bentonite may be part of the Fish Scales Formation.

**Well Information**

**Operator:** Sunfire Energy Corporation
**Well Name:** Amoco Thorhild 10-36-60-22
**Location:**
**UWI:** 100103606022W400
**Pool:** Unknown
**Field:** Thorhild (903)
**Province / State:** Alberta
**Country:** Canada

**Elevations**

**Reference:**
**Cut(-) / Fill(+):**
**K.B. to Ground:** m
**Ground:** 663.9 m
**Kelly Bushing:** 667.8 m
**Casing Flange:** m

**Surface Co - Ordinates**

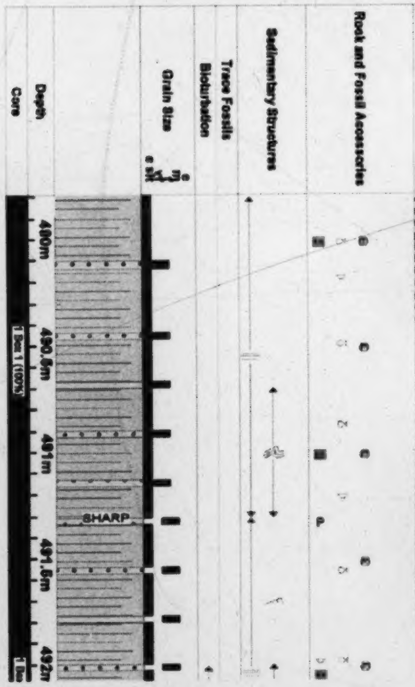
**Well Type:** Straight
**Longitude:** -113.156881
**Latitude:** 54.234284
**N / S Co - Ordinates:** 560.8
**E / W Co - Ordinates:** 468.8

**Bottom Hole Co - Ordinates**

**Longitude:** -113.156881
**Latitude:** 54.234284
**N / S Co - Ordinates:** 560.8
**E / W Co - Ordinates:** 468.8

**Well Summary**

**Spud Date:** Jan 15, 2977
**TD Date:**
**Contractor:**
**Rig Release Date:** Jan 22, 1977



**General Description**

489.79 - 491.31m : Weak to no reaction with HCl, dark gray shale, slightly silty clay, micas present, sand lams up to 2mm increasing in abundance down hole, fine light gray/beige sand, breaking blocky - breaks readily, fish and shelly debris, generally fining upwards with coarsest grains at the basal contact

491.31m : Sharp contact from thin sand lams above and thicker, more abundant sand lams below which increase downhole

491.31 - 493.8m : 25 to 50% sand - yellow/gray/beige, med-fine grained as lams/lenses, some loading, silty clay, weak to no reaction with HCl, breaking blocky, some fish debris, micas, ripples with cross-lams, wave reworking, disseminated pyrite

**Detailed Description**

490m: Fish debris - brown and resinous on broken surfaces

490.17m: Shelly debris, reacts vigorously with HCl

490.46m : Fish debris
490.54m : Pits and troughs filled with isolated lams of sand and silt

490.6m : Black organic fragments
490.66m : Sharp based sands start here, wave reworking, isolated sand lams, and increase down hole

491.04m : First appearance of white specks

491.19m : Sand lams increasing in abundance
491.31m : Sand lams up to 1cm in thickness

491.55 - 491.55m : Fish debris

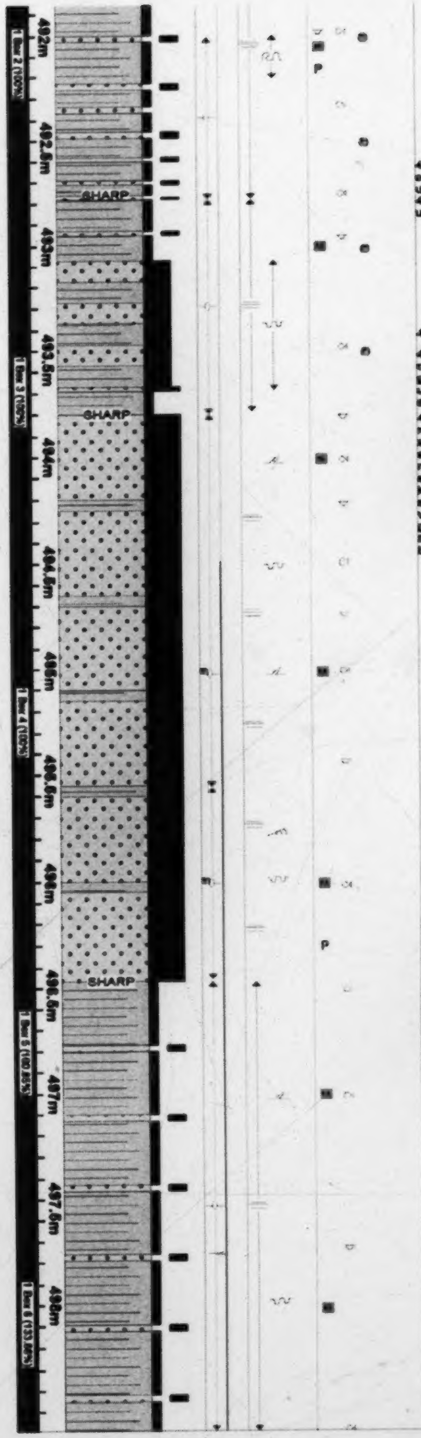
491.69m : White specks are very apparent, sand lams with cross lams
491.7 - 492.01m : Approx. 25% sand, 75% shale
491.96 - 491.96m : Layer full of fish debris and broken, shelly debris
492.01 - 492.21m : Approx. 30% sand, 70% shale, some loading and slumping, first appearance of

**Geochem Sample**

489.955 - 490.025m : 3939

490.96 - 491.02m : 3940

491.925 - 491.98m : 3941



492.78m : Sharp contact with overlying coarser grains, and underlying finer grains (491.31 - 492.78 m is generally a fining upwards package)

495.5m : Some wave reworking

493.8m : Sharp undulatory contact between overlying dk gray shale with sand lams and underlying sands which are not distinct

493.8 - 496.47m : Approx. 85% med-fine grained light gray/beige sand, 10-15% silty clay - dk gray shale, blocky breakage, weak to moderate reaction with HCl, some flame structures and loading - some primary sedimentary structures are still visible, shale lams/lenses, micas, gradational contacts for most of the shale and sand, many burrows filled sand

496.47m : Sharp contact between overlying sands with underlying distinct shale and sand

496.47 - 498.59m : Weak to vigorous reaction with HCl, dk gray shale with thin mm thick fine-med grain sand lams/lenses which are sharp based, sand lams decreasing in abundance down the interval, flame structures, loading, sandy lams are more distinct

debris and broken. shelly debris

492.01 - 492.21m : Approx. 30% sand, 70% shale, some loading and slumping, first appearance of bioturbation - a burrow a few mm in diameter

492.21 - 492.78m : Approx. 50% sand, 50% shale

492.33 - 492.33m : Fish debris

492.75m : Black organics, shelly debris, fish debris within sand

492.78 - 493.07m : Approx. 25% sand, 75% shale, large micas, sandy sections up to 3cm

493.07 - 493.67m : More mottled, shale is dk gray, 60% sandy, 40% shale, loading, burrows, pinching of sands, distinction between sand and shale becoming less distinct, generally a fining upwards package

493.67 - 493.8m : Approx. 30% sand, 70% shale, contacts between shale/sand are much sharper

Large amounts of black organic matter/fish debris/shelly debris randomly distributed within sand, decreasing in abundence towards the basal contact

496.3m : 0.5% pyrite

496.47 - 498.04m : Weak reaction with HCl

Fish debris/black organic matter decreasing in abundance downhole

498.04 - 498.59m : Strong reaction with HCl to the base of the core

491.925 - 491.98m : 3941

492.91 - 492.975m : 3942

493.995 - 494.065m : 3943

494.945 - 495.015m : 3944

495.965 - 496.03m : 3945

496.955 - 497.025m : 3946

497.94 - 498m : 3947

498.415 - 498.485m : 3948

## Well Information

**Operator:** Marathon Canada Limited
**Well Name:** Marathon Et Al Kakwa 14-28-62-5
**Location:**
**UWI:** 100142806205W600
**Pool:** Undefined Pool (999998)
**Field:** Kawka (519)
**Province / State:** Alberta
**Country:** Canada

## Elevations

| | | | |
|---|---|---|---|
| **Reference:** | | **Ground:** | 1059.8 m |
| **Cut(-) / Fill(+):** | | **Kelly Bushing:** | 1065 m |
| **K.B. to Ground:** | m | **Casing Flange:** | m |

## Surface Co - Ordinates

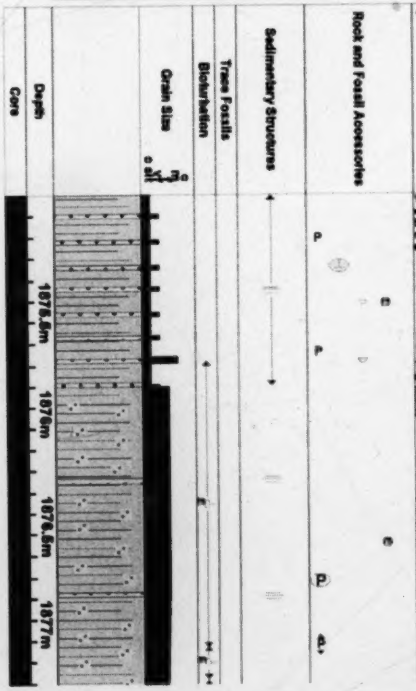
**Well Type:** Straight
**Longitude:** -118.689728
**Latitude:** 54.39630
**N / S Co - Ordinates:** 382.8
**E / W Co - Ordinates:** 561.4

## Bottom Hole Co - Ordinates

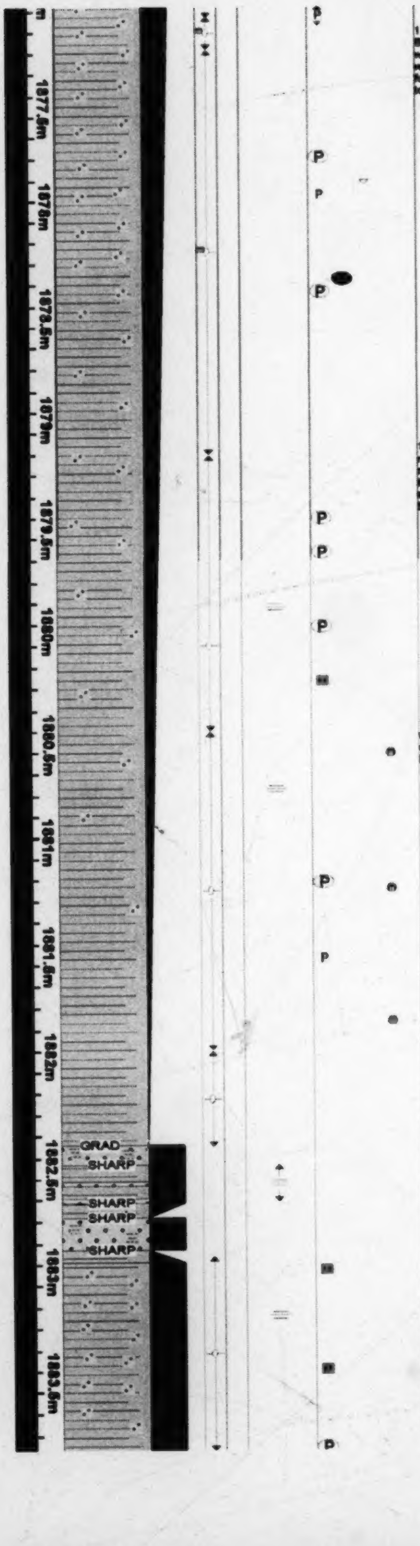
**Longitude:** -118.689728
**Latitude:** 54.39630
**N / S Co - Ordinates:** 382.8
**E / W Co - Ordinates:** 561.4

## Well Summary

| | | | |
|---|---|---|---|
| **Spud Date:** | | **Contractor:** | |
| **TD Date:** | | **Rig Release Date:** | |



| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 1875 - 1875.9m : Weak reaction with HCl, dk gray shale, rubble, black organics, silty lenses, mica rich, very fine white sand lams, shell fragments | 1875.2m : Sand lams with disseminated pyrite<br>1891.34m : Small calcareous nodule | |
| | | 1875.45 - 1875.51m : 3882 |
| 1875.78m : Undulatory top contact, start of fine salt and pepper coloured sand and shale intermixed downhole, abundant bioturbation | 1875.71m : Medium sand lenses, disseminated pyrite<br>1875.71 - 1875.78m : Med sand lenses, sand lams with disseminated pyrite, bioclastic material | |
| 1876.42 - 1877.71m : Bioturbated, intermixed fine sands and shales, mica rich, no reaction with HCl | 1876.33 - 1876.38m : Strong reaction with HCl, fine laminated sand, sharp tops and bases | 1876.32 - 1876.38m : 3883<br>1876.45 - 1876.52m : 3884 |
| | 1876.81m : Pyrite nodules<br>1876.87m : Sharp top and based 2cm thick sand bed | |
| 1877 17 - 1879.14m : Bioturbated, weak to no reaction | 1877.065 - 1877.165m : Pyrite filled burrows? | |



1877.17 - 1879.14m : Bioturbated, weak to no reaction with HCl, fine sand intermixed with shale, bioturbation and trace fossiles becoming more difficult to identify downhole

1879.14 - 1880.44m : No reaction with HCl, % of sand reduced to 5% intermixed with the dominant shale, silt lenses, sandy lams disturbed by bioturbation

1880.44 - 1881.86m : Silty shale with lenses of very fine to fine sand, mica rich, no reaction with HCl

1883.4 - 1884.56m : Intermixed 10-15% medium sand and silty shale, bioturbation becoming more distinct downhole, low to moderate reaction with HCl

1877.065 - 1877.165m : Pyrite filled burrows?

1877.78m : Pyrite nodule

1877.9m : Shelly fragments

1877.9 - 1878m : Pyritized burrow

1878.325 - 1878.415m : Siderite elipse, brown

1878.5m : Pyrite nodule

1878.33 - 1878.5m : Pyrite nodule

1878.9m : Less sandy, more shaley downhole

1879.45 - 1879.7m : Pyrite nodules

1879.79m : Little sand is visible

1880m : Pyrite nodules

1880.1 - 1880.3m : Silty shale with intermixed sand lenses visible

1881.2m : Pyrite nodule, green halo, red/orange colouration

1881.56m : Pyrite filled horizontal burrows

1881.8 - 1882.44m : Dk gray silty shale intermixed with very fine sand, rubble, gradual basal contact

1882.44 - 1882.528m : Dk gray shale intermixed with medium sand, sharp based

1882.528 - 1882.705m : Shale contains lams/lenses of beige/brown medium sand, sharp contacts and sharp base

1882.705 - 1882.775m : Becoming more shaley, sharp basal contact

1882.775 - 1882.925m : Moderate reaction with HCl, med. beige sand, sharp basal contact

1882.925 - 1882.985m : Shales grade into medium sand

1882.985 - 1883.4m : Very silty shale lams and lenses within medium sand, low reaction with HCl, biortubation is increasing, appears mottled

1877.44 - 1877.51m : 3885

1878.46 - 1878.53m : 3886

1879.4 - 1879.47m : 3887

1880.31 - 1880.38m : 3888

1881.34 - 1881.4m : 3889

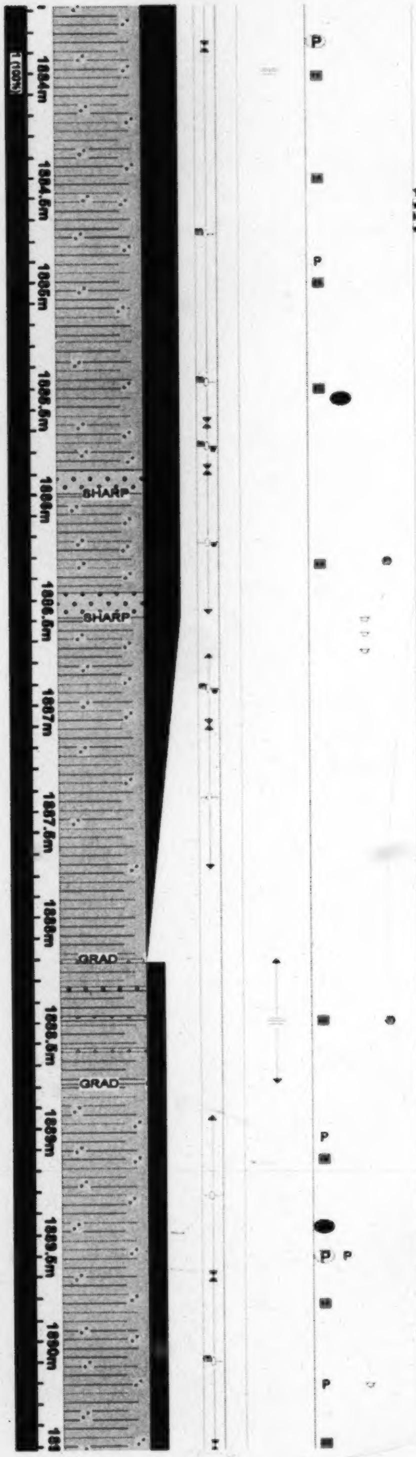
1881.56 - 1881.61m : 3890

1882.13 - 1882.18m : 3893

1882.35 - 1882.42m : 3891

1882.58 - 1882.6m : 3892

1883.22 - 1883.29m : 3894



1884.56 - 1885.91m : Silty shale with medium sand intermixed as lenses, bioturbation, no reaction with HCl

1889.6 - 1890.5m : Moderate bioturbation, dk gray silty shale with fine sand lams and intermixed, pyritized burrows, pyrite nodules, pyrite in some lams, rubble, shells

1883.845m : Pyrite nodules

1884.91m : Pyrite within horizontal burrows

1885.55 - 1885.69m : Elliptical nodule of siderite

1885.69 - 1885.89m : Increase in bioturbation and sand, medium beige sand
1885.89 - 1886m : Yellow/beige massive medium sand, sharp base

1886 - 1886.17m : High bioturbation, medium sand intermixed with mica rich silty shale, not reaction with HCl, gradational basal contact

1886.17 - 1886.24m : Massive medium sand bed with a sharp basal contact
1886.24 - 1886.465m : High bioturbation, medium sand intermixed with silty shale, gradational basal contact
1886.465 - 1886.585m : Massive medium beige/yellow sand bed with a sharp basal contact

1886.585 - 1886.745m : Sandy shale, no bioturbation, shelly debris, 3 shelly calcareous layers

1886.745 - 1887.5m : Moderate to high bioturbation, shale intermixed with upper fine/medium sand, coarser grained and lighter in colour at the top, bioturbation deacreasing downhole, shaley at the base

Little bioturbation, black vitreous lenses

1887.5 - 1888.2m : Intermixed fine sand and silty dk gray shale, low bioturbation at the top, no reaction with HCl

Bioturbation ending, dominantly finer grains, silts and clays, minor fine sand lenses and lams

1888.2 - 1888.8m : Gradational top and basal contacts, parallel lams and beds of very fine sand up to 2cm in thickness, mica rich silty shale, little visible bioturbation, no reaction with HCl

1888.86 - 1889.14m : Silty shale, concentrations of pyrite, black organics, rubble

1889.14 - 1889.6m : No reaction with HCl, low to moderate bioturbation, fine to very fine white sand intermixed in silty shale

Siderite nodule
Pyrite nodules, concentrations of pyrite

1890.23m : Shells, concentrations of pyrite

1884.37 -
1884.44m : 3895

1885.28 -
1885.36m : 3896

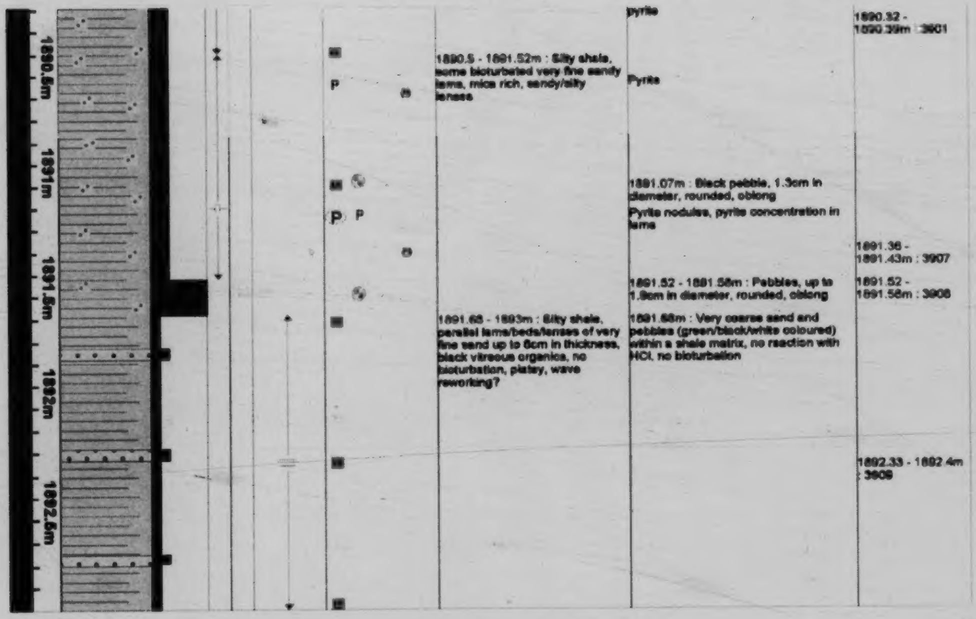
1886.32 - 1886.4m
: 3897

1887.29 -
1887.36m : 3898

1888.3 - 1888.36m
: 3899

1889.23 - 1889.3m
: 3900

1890.32 -
1890.39m : 3901


1890.5m
1891m
1891.5m
1892m
1892.5m
P
P P
1890.5 - 1891.52m : Silty shale, some bioturbated very fine sandy lams, mica rich, sandy/silty lenses
1891.65 - 1893m : Silty shale, parallel lams/beds/lenses of very fine sand up to 8cm in thickness, black vitreous organics, no bioturbation, platey, wave reworking?
pyrite
Pyrite
1891.07m : Black pebble, 1.3cm in diameter, rounded, oblong
Pyrite nodules, pyrite concentration in lams
1891.52 - 1891.58m : Pebbles, up to 1.9cm in diameter, rounded, oblong
1891.58m : Very coarse sand and pebbles (green/black/white coloured) within a shale matrix, no reaction with HCl, no bioturbation
1890.32 - 1890.39m : 3901
1891.36 - 1891.43m : 3907
1891.52 - 1891.58m : 3908
1892.33 - 1892.4m : 3909

**00/14-28-062-05W6/0: Marathon Et Al Kakwa 14-28-62-5**

*Core:* 1875m – 1893m

*Second White Specks interval from cross section:* 1873m - ?

*Observations:*

A lot of this core is fractured. The details were often difficult to log. At the base of the core, a combination of very fine sand and shale is observed with occasional sharp based sands. Above this is a pebble layer in a matrix of mud. Up section is the first time that bioturbation is observed within sandy shale. There seems to be an occasional influx of sands as well as the bioturbation increases up this section along with the abundance of siderite. Above this, there is a lack of bioturbation. It is dominated by a shale with occasional sandy laminations.

The next package is a coarsening upwards sequence (with an increase in the amount of sand and sand size up the logged core). Bioturbation also increases upwards. There is an abundance of shells, then a sharp based package of sand with no bioturbation observable. This is followed by a gradual transition back into bioturbation and muds, a sharp transition into sands, then gradually back into bioturbated sands. There is a slow upwards return to bioturbated sediments with some sands. At the top of the core is a shale with sandy laminations.

*Interpretation:*

There were no white specks observed at all in the core. Very little of the core reacted with hydrochloric acid. There was nothing to indicate whether or not this core was from the Second White Specks interval. This core did not look 'typical' of the Second White Specks Formation. Grain sizes all the way up to pebble size were observed. Very few shells or siderite were seen. The core resembles what would be expected for the Belle Fourche Formation, but this is unclear.

**Well Information**

**Operator:** Imperial Oil Resources Limited
**Well Name:** Imp Cdn-Sup Pembina 14-29 Br-48-6
**Location:**
**UWI:** 100142904806W500
**Pool:** Belly River 1 (126009)
**Field:** Pembina (685)
**Province / State:** Alberta
**Country:** Canada

**Elevations**

| | | | |
|---|---|---|---|
| **Reference:** | | **Ground:** | 851.9 m |
| **Cut(-) / Fill(+):** | | **Kelly Bushing:** | 856.5 m |
| **K.B. to Ground:** | m | **Casing Flange:** | m |

**Surface Co - Ordinates**

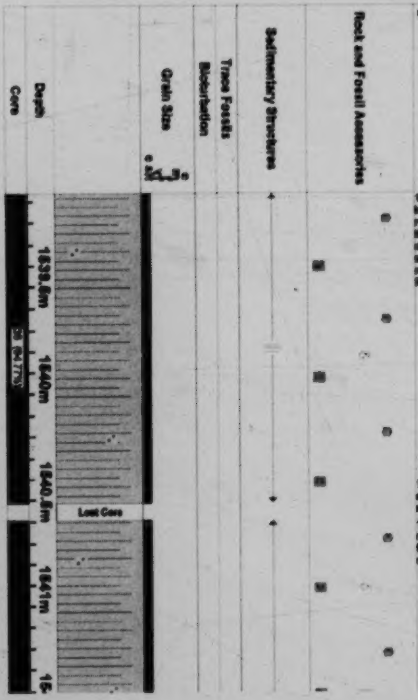
**Well Type:** Straight
**Longitude:** -114.844461
**Latitude:** 53.176285
**N / S Co - Ordinates:** 163.0
**E / W Co - Ordinates:** 603.5

**Bottom Hole Co - Ordinates**

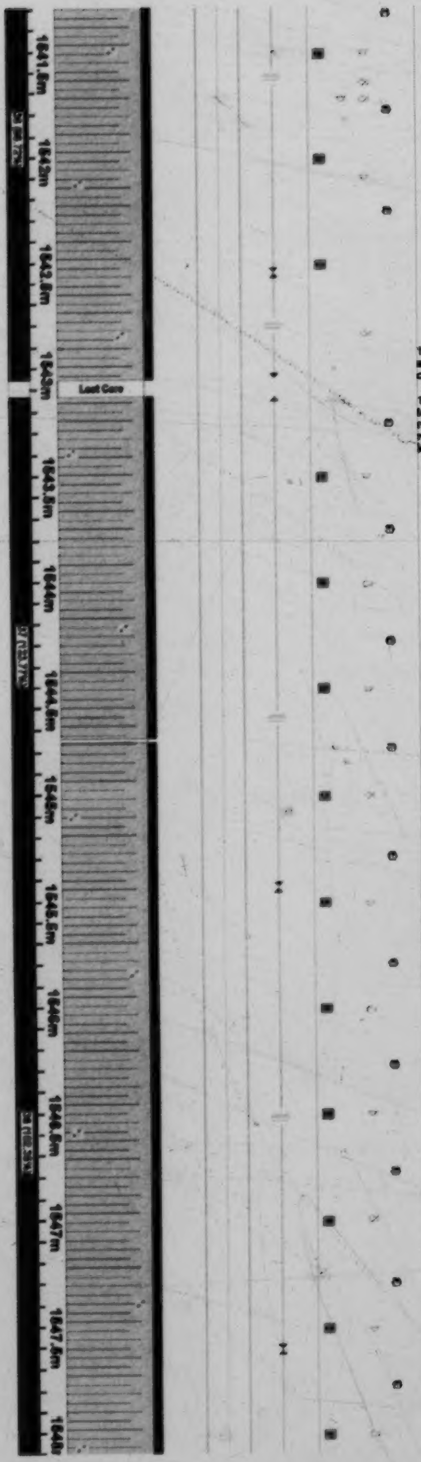
**Longitude:** 1-14.844461
**Latitude:** 53.176285
**N / S Co - Ordinates:** 163.0
**E / W Co - Ordinates:** 603.5

**Well Summary**

| | | | |
|---|---|---|---|
| **Spud Date:** | Oct 25, 1953 | **Contractor:** | |
| **TD Date:** | | **Rig Release Date:** | May 28, 1954 |


Core
Depth
Grain Size
Bioturbation
Trace Fossils
Sedimentary Structures
Rock and Fossil Accessories
1539.5m
1540m
1540.5m
1541m
Lost Core

| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 1539.16 - 1540.81m : Moderate to strong reaction with HCl, HCl reaction increases to the base of the core, dk grey shale, with clays and 10-15% silt, lenses of silt and very fine sand, 1% micas, fish debris, no shells, fissile | | 1539.45 - 1539.46m : 316 |
| 1540.81 - 1540.69m : Lost core arbitrarily added to the end of the section | | 1540.48 - 1540.49m  317 |
| 1540.69 - 1543.05m : Moderate reaction with HCl, minor shells, fish debris, concentrations of silt, micas | | |
| | | 1541.46 - |



1543.05 - 1543.13m : Lost core arbitrarily added to the end of the core

1543.13 - 1545.57m : Moderate to strong reaction with HCl, HCl reaction increasing downwards, mica rich, 5-10% silt and silt lenses, fish debris, shelly debris

1545.57 - 1546.15m : Extra core in core 37

1545.57 - 1547.75m : Strong reaction with HCl, abundant micas, shells, fish debris, 5-10% silt as lenses and lams, quartz grains

1547.7 - 1547.75m : Extra core in core 38

1547.7 - 1549.88m : Strong reaction with HCl, dk gray shale, a few shells, concentrations and lams of silt, fish debris

1541.65m : Concentrated layer of fish debris

1541.72m : White specks, concentrated shelly/fish debris

1542.09m : Shelly layer

1544.08m : Thin lams composed of concentrations of white specks

Large shell

1544.73m : 1cm (reworked?) clast of bentonite, quartz, large black mica flakes

1545.08m : Thin lams of concentrated white specks

Medium sand sized quartz grains

1547.32m : Black vitreous organics, breaking randomly

Very large shells

1541.45 - 1541.45m : 318

1542.45 - 1542.46m : 319

1543.49 - 1543.5m : 320

1544.37 - 1544.38m : 321

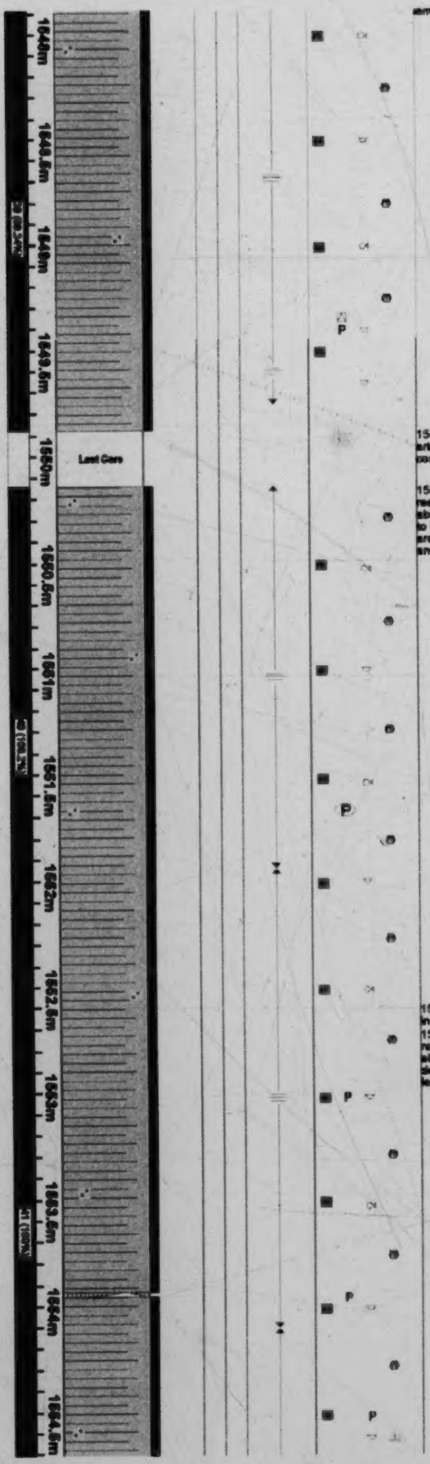
1545.45 - 1545.46m : 322

1546.09 - 1546.1m : 323

1546.98 - 1546.99m : 324

1547.45 - 1547.47m : 4514

1547.87 - 1547.88m : 325



lams of silt, fish debris

1549.88 - 1550.14m : Lost core arbitrarily added to the end of the core

1550.14 - 1552.58m : Strong reaction with HCl, fissile, abundant micas, shells parallel to fissility, orange colouration in areas, minor fish debris, lenses and lams of silt

1552.58 - 1552.78m : Extra core in core 40

1552.58 - 1554.71m : Strong reaction with HCl, mica rich, abundant shells, minor fish debris, thins silty lams and lenses

1549.35m : Fine quartz grains

1549.4m : Pyritized shell, thickness and abundance of shells increasing downhole

1549.65m : Abundant shells in layer (wave reworked?)

Pyrite nodule

No visible change in grain size, silt slightly more abundant downhole

1553.01m : Pyritized shell, some very large shells

1553.94 - 1553.95m : 1cm thick gray bentonite, sharp based, brown colouration and pyritized at the top

Carbonate filling voids/fractures, shelly layers

1547.87 - 1547.88m : 325

1548.75 - 1548.76m : 326

1549.83 - 1549.84m : 327

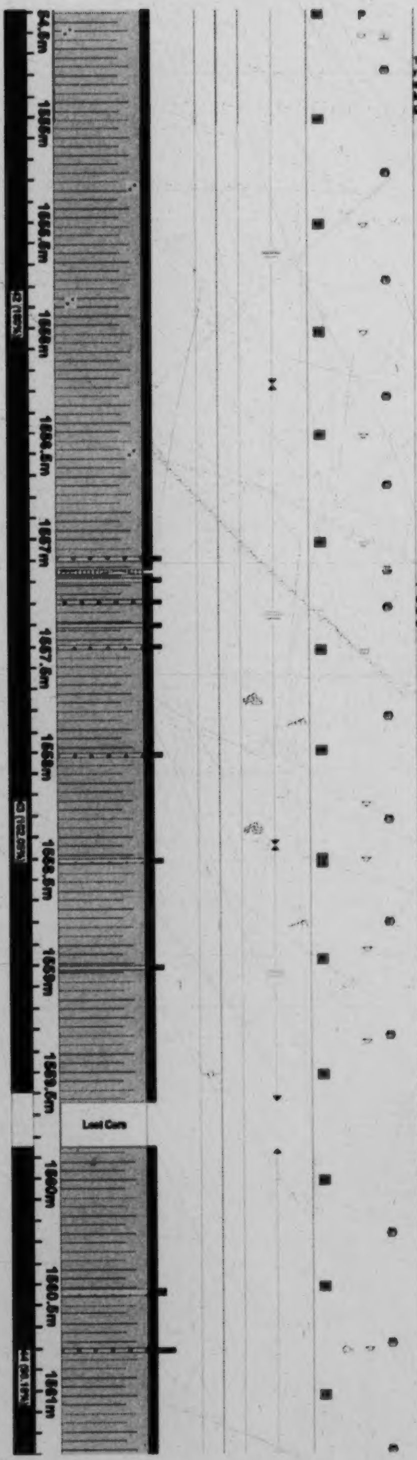
1550.88 - 1550.89m : 328

1551.96 - 1551.98m : 329

1552.81 - 1552.82m : 330

1553.96 - 1553.97m : 331

1554.21 - 1554.22m : 332



1554.71 - 1557.15m : Strong reaction with HCl, abundant shells, very fine sand lams/lenses, sharp based, gradational tops, silt lenses

1557.15 - 1559.84m : Strong reaction with HCl, lenses of silt, very fine sand lams, abundant shells

1559.84 - 1559.85m : Lost core arbitrarily added to the end of the core

1559.85 - 1561.96m : Strong reactinn with HCl, lenses of silt, dk grey shale, dominantly clays, mica rich

Carbonate filling voids/fractures, shelly layers

1556.24m : Lenses of black vitreous organics

1557.005m : Gradual contacts from overlying shale and underlying shale with sand lams, increasing shelly debris downhole

1557.075 - 1557.515m : Abundant very fine white sand lams and lenses, sharp based, pinching and thickening

1557.15m : Bentonite?, soft, white, abundant dark micas, sharp base

1557.5m : Soft sed deformation, loading, ripples with cross lams, sand lams becoming less abundant downhole

1558.24m : Abundant shells (reworked?), some sand lams

1558.5 - 1559m : Abundant shells

1558.795m : Sand ripples with cross lams

1558.825m : Black vitreous organics

Wave reworked shells, abundant shelly debris

1559.69 - 1560.465m : Few shells, little to no sand lams

1560.465m : Abundant sand lams, abundant shells downhole

1558.795 - 1558.8m : Fine grained lams full of shells and fish debris

1560.94 - 1561.07m : Sand lams, shells decreasing in abundance

1561.07m : Silt lenses, abundant shells, shells increasing in abundance, some reworked shells

1555.01 - 1555.02m : 333

1555.91 - 1555.92m : 334

1557.01 - 1557.02m : 335

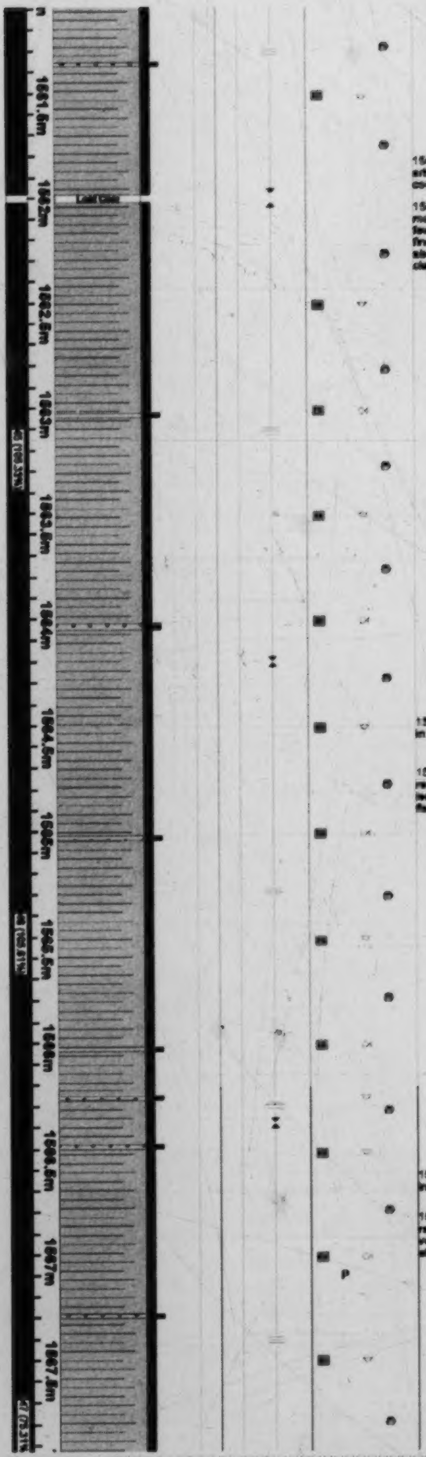
1558.01 - 1558.02m : 336

1558.81 - 1558.82m : 337

1558.99 - 1559.0m : 338

1559.94 - 1559.95m : 339

1561.04 - 1561.05m : 340



1561.07m : Silt lenses, abundant shells, shells increasing in abundance, some reworked shells

1561.96 - 1562.02m : Lost core arbitrarily added to the end of the core

1562.02 - 1564.46m : Strong to moderate reaction with HCl, a few shells, fish debris, thin very fine sand lams decreasing in abudance downhole, 5-10% silt, clay rich shale

1564.07m : Little to no sand lams, minor shells, dominantly shale, hard to see any white specks

1564.46 - 1564.50m : Extra core in core 45

1564.46 - 1566.72m : Strong reaction with HCl, 10% silt, silt lenses, mica rich, minor shells, fish debris

1566 - 1566.50m : Minor parallel very fine sand lams, shells increasing in abundance

1566.6 - 1566.72m : Extra core in core 46

1566.6 - 1568.43m : Strong reaction with HCl, 5-10% silt, very fine sand lams, minor shells, fish debris, silt lenses

1567.08m : Lenses 3mm thick, full of pyrite

1561.05m : 340

1561.95 - 1561.96m : 341

1563.14 - 1563.15m : 342

1564.16 - 1564.17m : 343

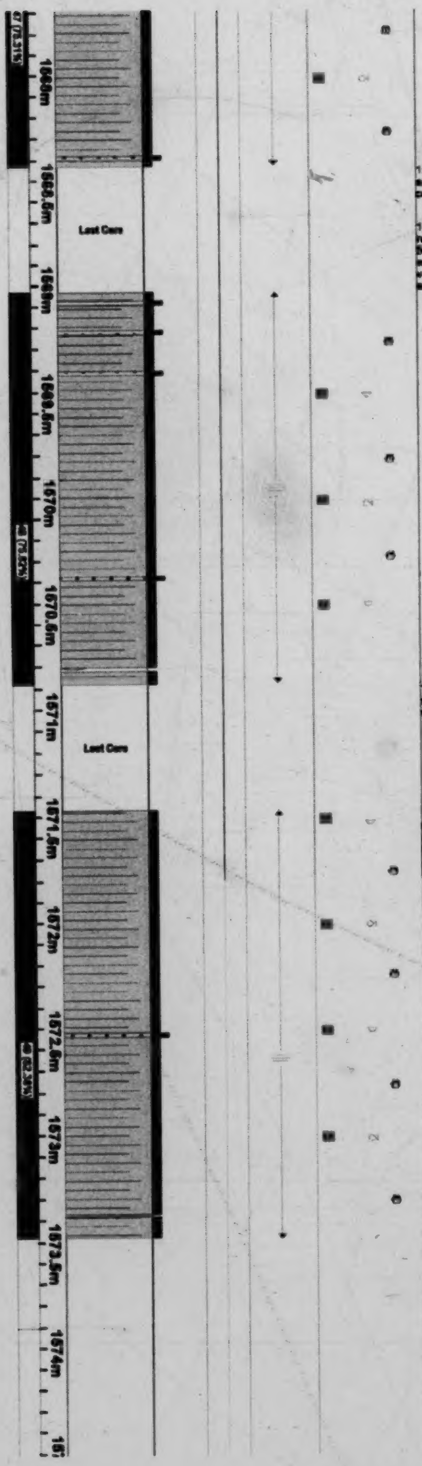
1565.1 - 1565.11m : 344

1566.11 - 1566.12m : 345

1566.66 - 1566.67m : 346

1567.07 - 1567.08m : 347

1567.82 - 1567.83m : 348


1568m
1568.5m
Lost Core
1569m
1569.5m
1570m
1570.5m
1571m
Lost Core
1571.5m
1572m
1572.5m
1573m
1573.5m
1574m

1567.82 - 1567.83m : 348

1568.43 - 1569.03m : Lost core arbitrarily added to the end of the core

1568.4 - 1568.5m : Concentration of very fine sand lams, quartz grains, white specks?

1569.03 - 1570.88m : Strong reaction at top of core, bottom 50cm medium to low reaction with HCl, 15-20% silt lenses, very fine sand lams, minor shells, mica rich, fish debris

1569.03 - 1569.43m : Minor very fine sand lams

1569.49 - 1569.5m : 349

1570.37 - 1570.37m : 350

1570.8m : Bentonite? Brown colouration

1570.88 - 1571.47m : Lost core arbitrarily added to the end of the core

1571.47 - 1573.48m : Strong reaction with HCl to a weak reaction with HCl at the base of the core, minor shells, fish debris, a few white specks

1571.65 - 1571.66m : 351

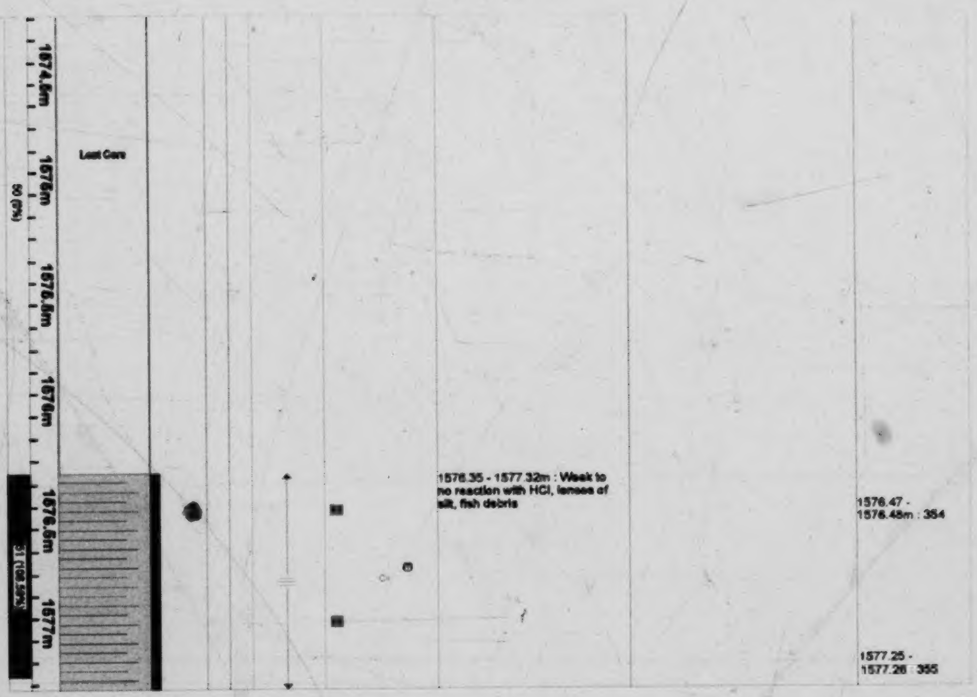
1572.69 - 1572.7m : 352

Thin green bentonite?

1573.48 - 1573.91m : Lost core arbitrarily added to the end of the core

1573.91 - 1578.35m : Lost core

1573.91 - 1573.92m : 353


1574.5m
1575m
1575.5m
1576m
1576.5m
1577m
50 (0%)
51 (108.5%)
Lost Core

1576.35 - 1577.32m : Week to no reaction with HCl, lenses of silt, fish debris

1576.47 - 1576.48m : 354

1577.25 - 1577.26 : 355

**Well Information**

| | |
|---|---|
| **Operator:** | **Canadian Natural Resources Limited** |
| **Well Name:** | **CNRL Pine 15-21-56-19** |
| **Location:** | |
| **UWI:** | 100152105619W500 |
| **Pool:** | Cardium, 2WPSK, U Mann M... (177660) |
| **Field:** | Pine Creek (706) |
| **Province / State:** | Alberta |
| **Country:** | Canada |

**Elevations**

| | | | |
|---|---|---|---|
| **Reference:** | | **Ground:** | 1353.9 m |
| **Cut(-) / Fill(+):** | | **Kelly Bushing:** | 1357.6 m |
| **K.B. to Ground:** | m | **Casing Flange:** | m |

**Surface Co - Ordinates**

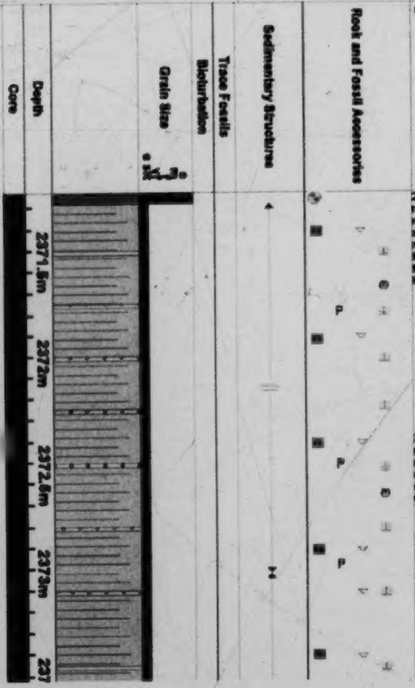
| | |
|---|---|
| **Well Type:** | Straight |
| **Longitude:** | -116.756922 |
| **Latitude:** | 53.857979 |
| **N / S Co - Ordinates:** | 332.7 |
| **E / W Co - Ordinates:** | 439.5 |

**Bottom Hole Co - Ordinates**

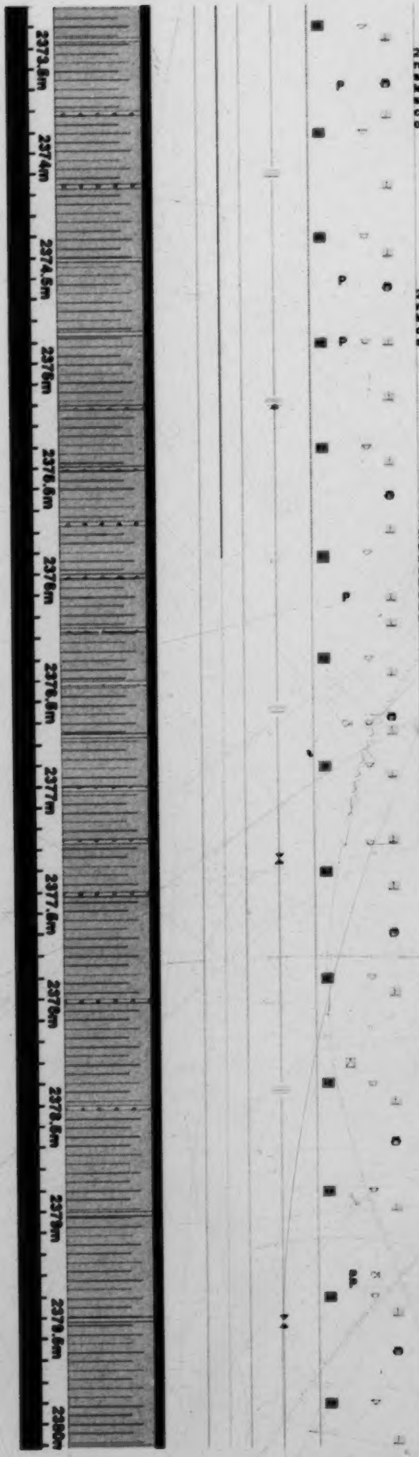
| | |
|---|---|
| **Longitude:** | -116.756922 |
| **Latitude:** | 53.857979 |
| **N / S Co - Ordinates:** | 332.7 |
| **E / W Co - Ordinates:** | 439.5 |

**Well Summary**

| | | | |
|---|---|---|---|
| **Spud Date:** | Oct 2, 1977 | **Contractor:** | |
| **TD Date:** | | **Rig Release Date:** | Oct 30, 1977 |



| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 2371.23 - 2372.37m : Strong reaction with HCl (some lams react more vigorously), dk gray shale, clay with some silt lenses, mica rich, abundent large Inoceramus imprints, shell fragments, thin calcareous lams/lenses | 2371.23 - 2371.28m : Top 5cm with subrounded pebbles, up to 0.4cm in diameter, silt | |
| | | 2371.61 - 2371.66m : 4525 |
| | 2371.78 - 2371.79m : Calcareous lams/lenses full of pyrite | |
| | | 2371.83 - 2371.9m : 4523 |
| | Calcareous lenses with pyrite | |
| | | 2372.31 - 2372.37m : 4524 |
| 2372.37 - 2373.515m : Strong reaction with HCl, dk gray shale, minor silt <5%, silt lenses, some shells and imprints, very fine calcareous lams/lenses often with disseminated pyrite | 2372.5m Calcareous lam with pyrite | |
| | 2373.1m : Shells, reworked? | 2373.05 - 2373.12m : 4526 |



2373.515 - 2374.655m : Strong reaction with HCl, abundant shells and Inoceramus imprints, lenses of silt, dominantly dk gray shale, mica rich, mm thick calcareous lams and lenses full of pyrite

2374.655 - 2375.8m : Strong reaction with HCl, some shell imprints and fragments, very fine calcareous lams, mica rich, some silt lenses

2375.8 - 2376.94m : Strong reaction with HCl (some lams are more reactive than others), mica rich, dominantly clays with silt lenses, some shells fragments and imprints, calcareous lams becoming more abundant and thicker downhole

2376.94 - 2378.085m : Moderate reaction with HCl, dk gray shale, lenses of silt, some Inoceramus imprints, shell fragments, mica rich, a few quartz grains, a few calcareous lams

2378.085 - 2379.225m : Weak reaction with HCl, dk gray shale, clays with some lenses of silt, minor calcareous lams, some large Inoceramus shells and imprints

2379.225 - 2380.37m : Weak reaction with HCl, dk gray shale, shells and shell imprints, silty lenses, micas, a few calcareous lams

2374.915m : Calcareous lams (mm thick), full of pyrite

2376.1 - 2376.13m : Very fine calcareous lams/lenses, sharp tops and bases, full of pyrite, up to 2mm in thickness

2376.7m : Fish debris, shells

2377.24m : Shells

2378.3m : Fine grained quartz grains in a lense

2379.3m : Pyritized shell, fish fragments
2379.325m : Very fine silt sized calcareous lams full of pyrite

2373.81 - 2373.88m : 4527

2374.84 - 2374.91m : 4528

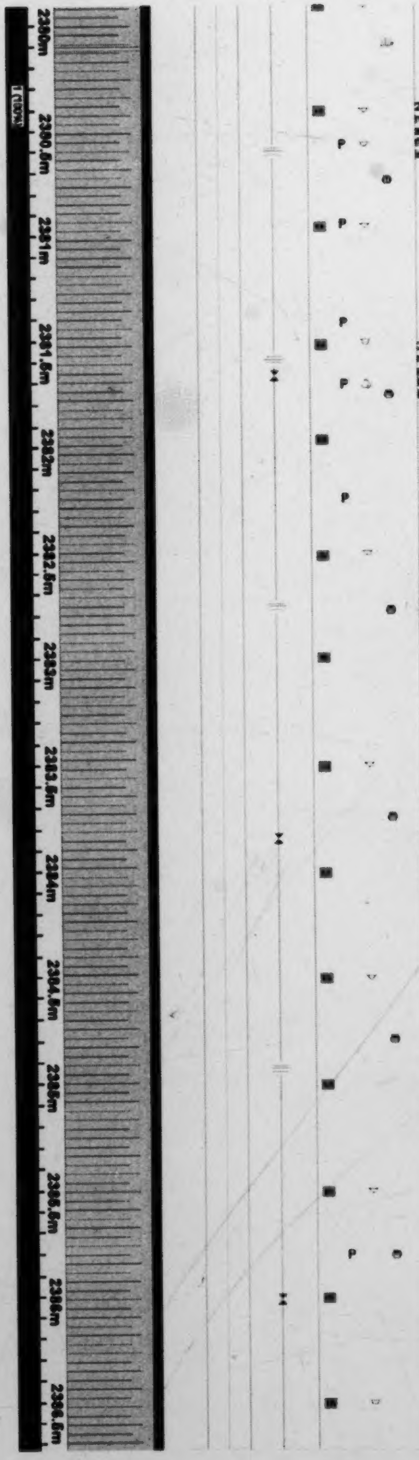
2375.82 - 2375.89m : 4529

2376.79 - 2376.77m : 4530

2377.79 - 2377.86m : 4531

2378.88 - 2378.96m : 4532

2379.9 - 2379.97m : 4533



2380.37 - 2381.51m : Weak reaction with HCl, dk gray shale, silty lenses, abundant shell fragments and Inoceramus, shell imprints, pyrite

2381.51 - 2382.655m : Weak reaction with HCl, pyrite nodules, pyritized shells, micas, silty lenses and lams, large Inoceramus shells, shell imprints

2382.655 - 2383.795m : Weak reaction with HCl, dk gray shale, silty lenses, some shell fragments and imprints

2383.795 - 2384.94m : Weak reaction with HCl, dk grey shale, clay rich, micas, little disseminated silt, silt lenses, minor shells

2384.94 - 2386.08m : Very weak reaction with HCl, rubbly, clays with <5% silt, silt lenses, mica rich, shells

2386.08 - 2387.225m : Weak to no reaction with HCl, dk gray shale, clay and mica rich, silty lenses

2380.56m : Pyritized shell

Pyritized shell
2380.89m : 1mm thick lense full of pyrite

Pyritized shells

2381.7m : Pyritized gastropod

2383.575m : Shells are smaller in size downhole

2385.8m : Pyritized shell

2386.6 - 2387.2m : Fish debris, a few shell imprints

2379.9 - 2379.97m : 4533

2380.87 - 2380.94m : 4534

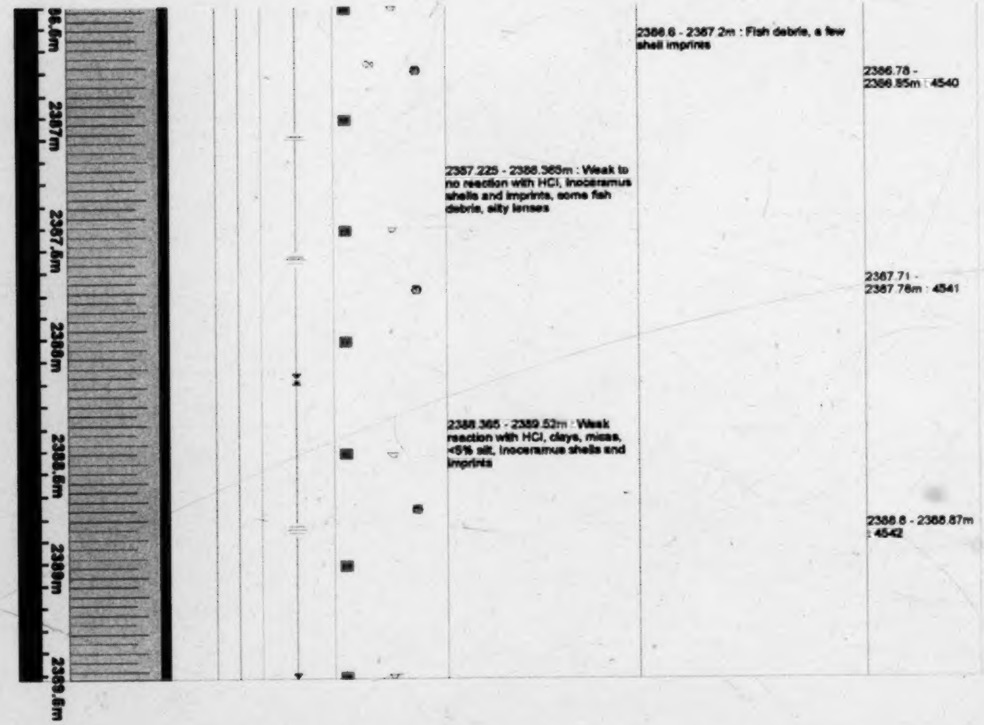
2381.99 - 2382.06m : 4535

2382.98 - 2383.05m : 4536

2383.73 - 2383.8m : 4537

2384.82 - 2384.89m : 4538

2385.79 - 2385.86m : 4539


86.6m
2387m
2387.5m
2388m
2388.5m
2389m
2389.5m
2386.6 - 2387.2m : Fish debris, a few shell imprints
2386.78 - 2386.85m : 4540
2387.225 - 2388.365m : Weak to no reaction with HCl, Inoceramus shells and imprints, some fish debris, silty lenses
2387.71 - 2387.78m : 4541
2388.365 - 2389.52m : Weak reaction with HCl, clays, micas, <5% silt, Inoceramus shells and imprints
2388.8 - 2388.87m : 4542

**00/15-21-056-19W5/0: CNRL Pine 15-21-56-19**

*Core:* 2371.23m – 2389.52m

*Second White Specks interval from cross section:* Not in cross section

*Observations:*

The base of the core is composed of a dark grey shale, dominated by clays with minor silt. There is weak to no reaction with hydrochloric acid. Some *Inoceramus* shells and imprints are visible. Moving up the logged core, there is minor disseminated pyrite, along with a few pyritized shells. At 2380m depth, shells become more abundant. Sandy calcareous laminations become visible, along with an increase in reaction with hydrochloric acid. Planar parallel laminations are present. The top 5cm of core consists of sub rounded pebbles, up to 0.4cm in diameter with concentrations of silt.

*Interpretation:*

Based on the log signatures, it appears that this core lies near the base of the Second White Specks Formation interval. Using micropaleontology, the core could not be confirmed to be the Second White Specks Formation. The base of the core was most likely deposited during a sea level rise because of the fine grained sediments coupled with the lack of sand. Silt appears to have been concentrated along bedding planes due to the action of bottom currents. The core was fairly homogeneous, indicating stable conditions, until 2380m depth, where sandy calcareous laminations are visible along with an increase in the abundance of fish and shelly debris. Current activity increased and most likely concentrated the sandy laminations and allowed for the deposition of coarser grains in the deeper environment. Disseminated pyrite and abundant organic debris are preserved, therefore, the environment was most likely more reduced. The deposition of fine grained sediments within a low energy environment continued up hole until the top of the core where pebbles are observed. Pebble sized sediments are not expected within the Second White Specks Formation. This, in conjunction with the fact that no white specks are observed indicates that the core is most likely of another formation.

## Well Information

| | |
|---|---|
| **Operator:** | **Imperial Oil Resources Limited** |
| **Well Name:** | **Imperial-Battle Lake No 1** |
| **Location:** | |
| **UWI:** | 100161204603W500 |
| **Pool:** | Undefined Pool (999998) |
| **Field:** | Pembina (685) |
| **Province / State:** | Alberta |
| **Country:** | Canada |

## Elevations

| | | | |
|---|---|---|---|
| **Reference:** | | **Ground:** | 933.9 m |
| **Cut(-) / Fill(+):** | | **Kelly Bushing:** | 936.3 m |
| **K.B. to Ground:** | m | **Casing Flange:** | m |

## Surface Co - Ordinates

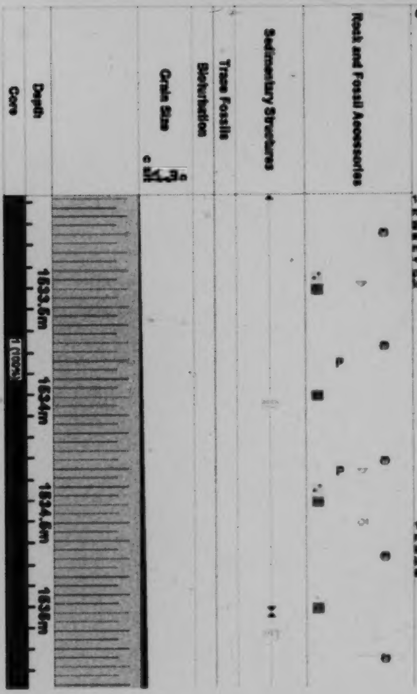
| | |
|---|---|
| **Well Type:** | Straight |
| **Longitude:** | -114.293685 |
| **Latitude:** | 52.957954 |
| **N / S Co - Ordinates:** | 201.0 |
| **E / W Co - Ordinates:** | 200.8 |

## Bottom Hole Co - Ordinates

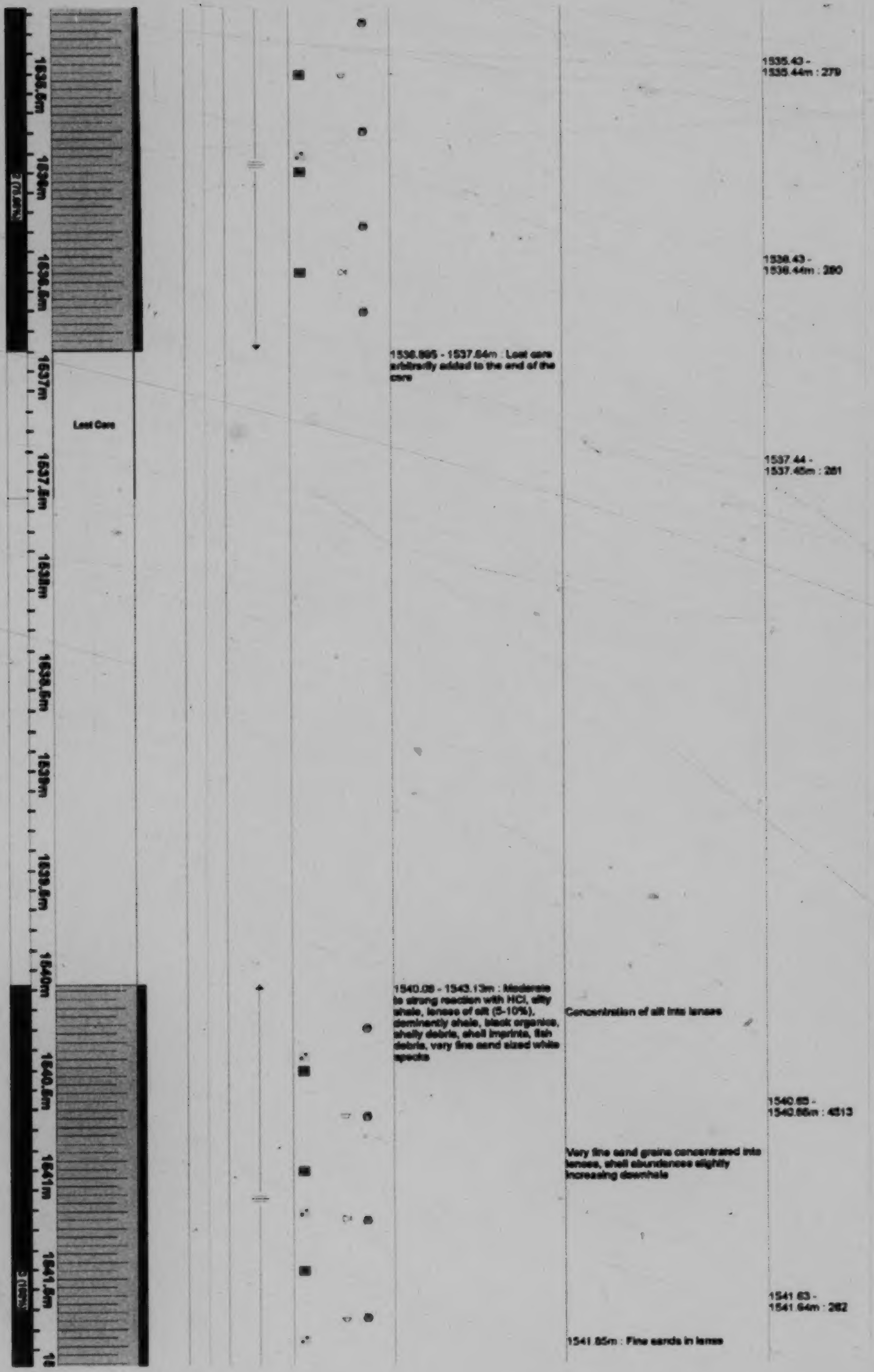
| | |
|---|---|
| **Longitude:** | -114.293685 |
| **Latitude:** | 52.957954 |
| **N / S Co - Ordinates:** | 201.0 |
| **E / W Co - Ordinates:** | 200.8 |

## Well Summary

| | | | |
|---|---|---|---|
| **Spud Date:** | Jun 23, 1947 | **Contractor:** | |
| **TD Date:** | | **Rig Release Date:** | Jan 3, 1948 |



| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 1533.07 - 1534.6m : Weak to moderate reaction with HCl, dk gray shale, very fine white specks concentrated in lenses, mica rich, minor silt lenses <10%, clays, disseminated pyrite, shells, shelly debris and imprints | Concentrations of silt and sand into lenses | 1533.07 - 1533.08m : 4512 |
| | | 1533.43 - 1533.12m : 277 |
| | 1533.85m : Silt content increased downhole to 15-20% silt, disseminated pyrite | |
| | 1534.355m : Pyritized shell | |
| | 1534.6m : Some fish debris | 1534.44 - 1534.44m : 278 |
| 1534.6 - 1536.895m : Moderate reaction with HCl, shale with less than 5% silt, shelly debris and imprints, black organic material, fish debris | 1534.85m : Sand increasing in abundance downhole | |


1535.5m
1536m
1536.5m
1537m
1537.5m
1538m
1538.5m
1539m
1539.5m
1540m
1540.5m
1541m
1541.5m
Lost Core

1536.895 - 1537.84m : Lost core arbitrarily added to the end of the core

1540.08 - 1543.13m : Moderate to strong reaction with HCl, silty shale, lenses of silt (5-10%), dominantly shale, black organics, shelly debris, shell imprints, fish debris, very fine sand sized white specks

Concentration of silt into lenses

Very fine sand grains concentrated into lenses, shell abundances slightly increasing downhole

1541.85m : Fine sands in lenses

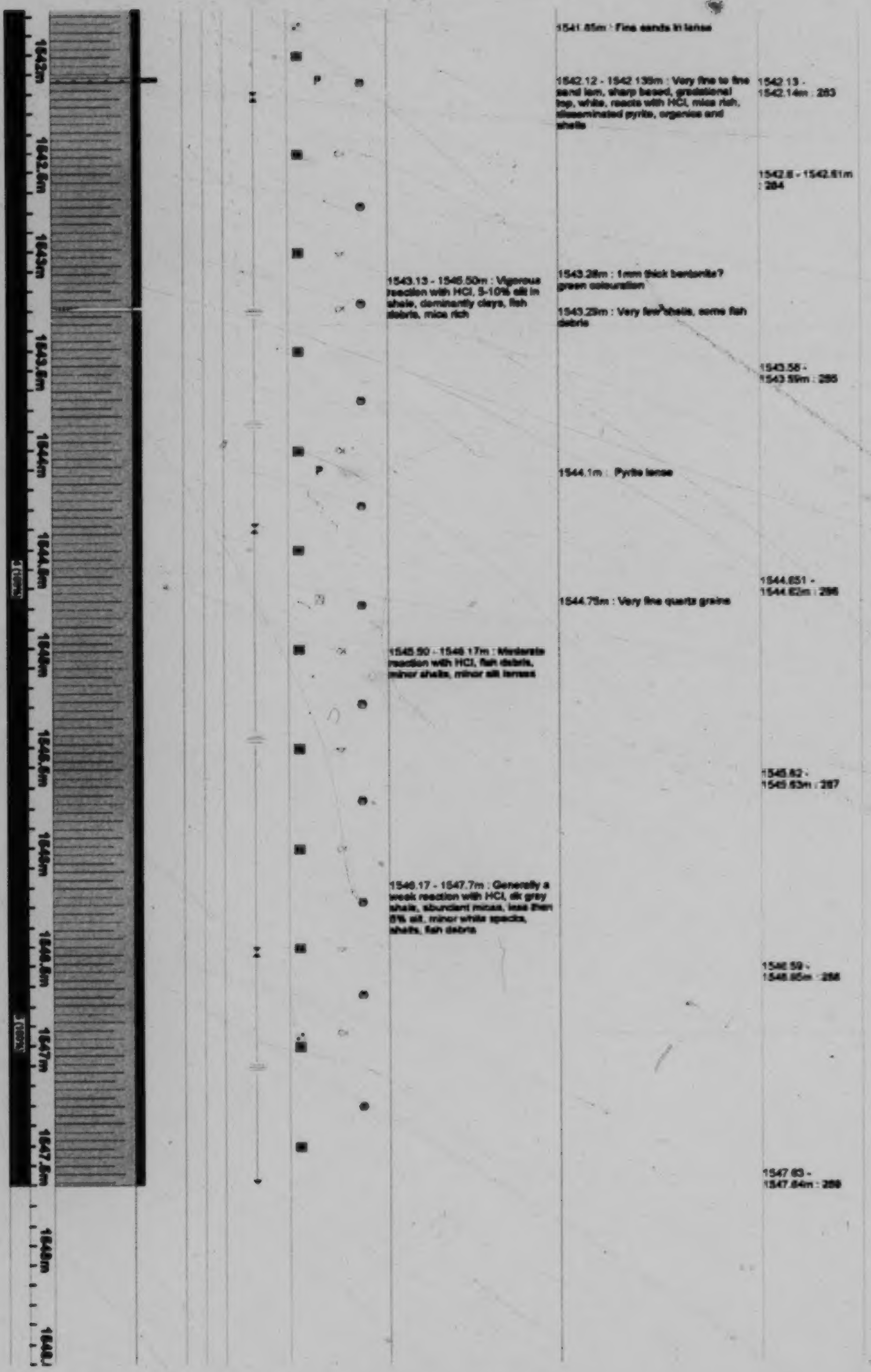
1535.43 - 1535.44m : 279

1536.43 - 1536.44m : 280

1537.44 - 1537.45m : 281

1540.85 - 1540.86m : 4513

1541.63 - 1541.64m : 282



1542m
1542.5m
1543m
1543.5m
1544m
1544.5m
1545m
1545.5m
1546m
1546.5m
1547m
1547.5m
1548m
1548.
P
P

1541.85m : Fine sands in lanse

1542.12 - 1542.135m : Very fine to fine sand lam, sharp based, gradational top, white, reacts with HCl, mica rich, disseminated pyrite, organics and shells

1542.13 - 1542.14m : 283

1542.6 - 1542.61m : 284

1543.13 - 1545.50m : Vigorous reaction with HCl, 5-10% silt in shale, dominantly clays, fish debris, mica rich

1543.28m : 1mm thick bentonite? green colouration

1543.29m : Very few shells, some fish debris

1543.58 - 1543.59m : 285

1544.1m : Pyrite lanse

1544.651 - 1544.62m : 286

1544.75m : Very fine quartz grains

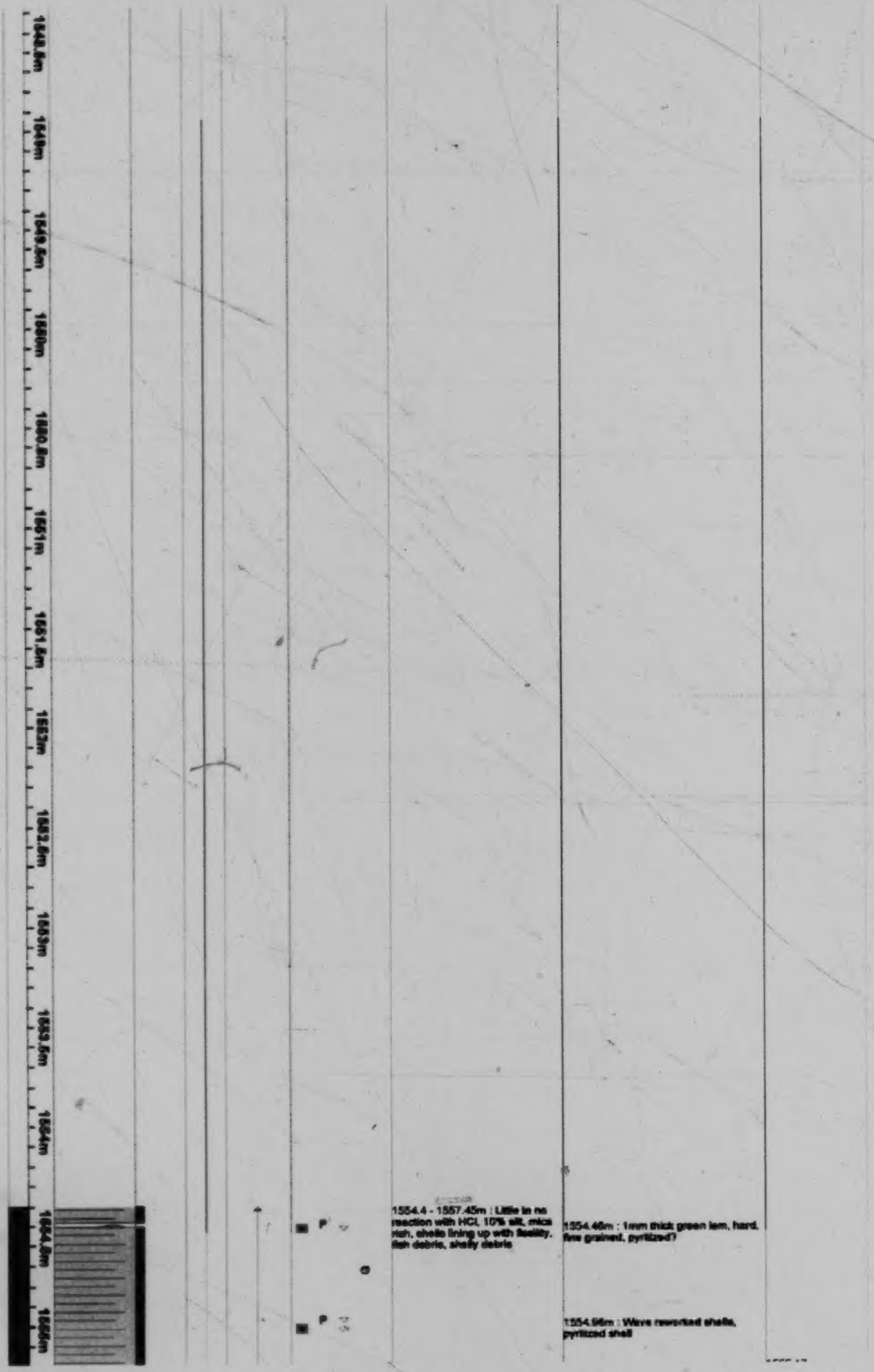
1545.50 - 1546.17m : Moderate reaction with HCl, fish debris, minor shells, minor silt lenses

1545.62 - 1545.63m : 287

1546.17 - 1547.7m : Generally a weak reaction with HCl, dk grey shale, abundant micas, less than 5% silt, minor white specks, shells, fish debris

1546.59 - 1546.60m : 288

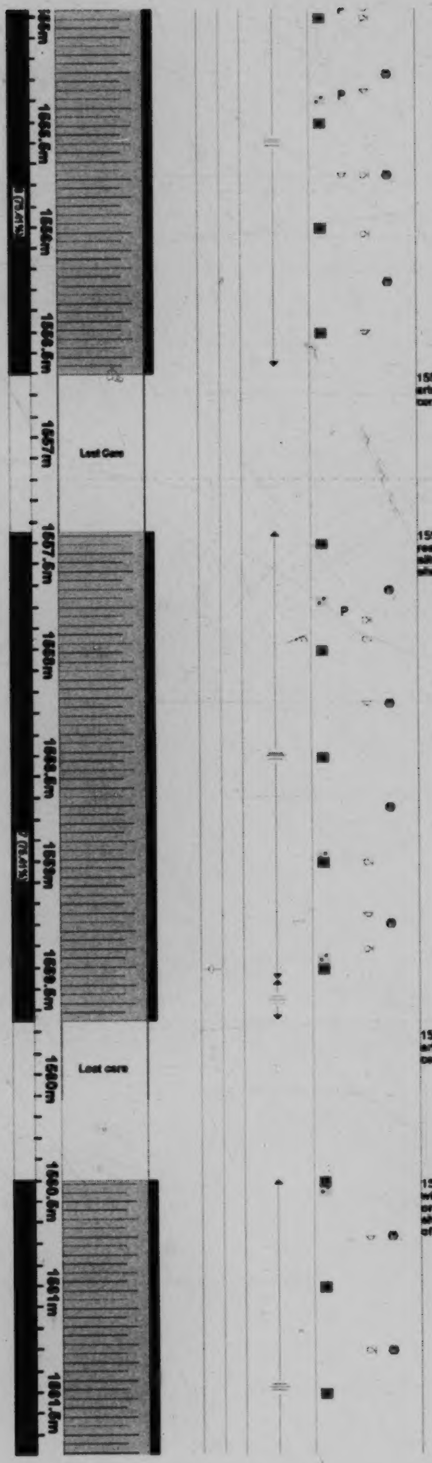
1547.83 - 1547.84m : 289



1554.4 - 1557.45m : Little to no reaction with HCl, 10% silt, mica rich, shells lining up with fissility, fish debris, shelly debris

1554.46m : 1mm thick green lam, hard, fine grained, pyritized?

1554.96m : Wave reworked shells, pyritized shell



1556.7 - 1557.45m : Lost core arbitrarily added to the end of the core

1557.46 - 1559.75m : No reaction with HCl, minor shells, silty lenses <10%, clays, dk grey shale, fish debris

1559.75 - 1560.5m : Lost core arbitrarily added to the end of the core

1560.5 - 1563.55m : No reaction with HCl, mica rich, some rusty orange colouration in areas, shells and shelly imprints, lenses of silt, dk gray shale, fish debris

1554.96m : Wave reworked shells, pyritized shell

1555.36m : Pyritized shell

1555.4m : Pyrite lense (3mm thick), a few concentrated white specks

1555.75m : Abundant fish debris, minor shells

1556.03m : Abundant fish debris

1557.77m : Concentration of very fine white specks

1557.82m : Pyritized shells

1557.88m : Abundant fish debris

1557.95m : Micro ripples, fish debris layer

1558.25m : Large shell

1559 - 1559.75m : Abundant fish debris, fish tooth, minor white specks?

1560.5m : White specks, very fine grained in concentrations

1555.17 - 1555.18m : 291

1555.29 - 1555.3m : 290

1556.25 - 1556.26m : 292

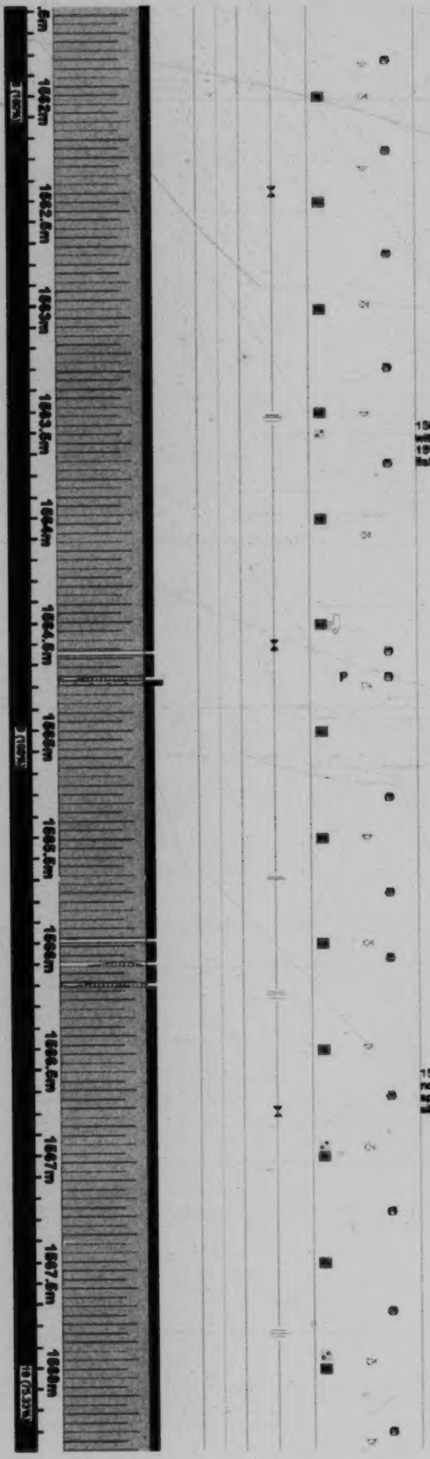
1556.56 - 1556.57m : 293

1557.94 - 1557.95m : 294

1558.05 - 1558.06m : 295

1559.02 - 1559.03m : 296

1560.77 - 1560.78m : 297



1561.78 -
1561.79m : 298

1562m : Mica rich, fish debris, shale is slightly siltier (15%)

1562.35 - 1562.39m : Large shells

1562.78 -
1562.79m : 299

1563.55 - 1566.6m : No reaction with HCl, mica rich, clays with 15% silt lenses, dk grey shales, fish debris, shells

1563.6m : Pyrite nodule, very fine white specks

1563.77 -
1563.78m : 300

1564.63 - 1564.64m : Yellow, altered?, bentonite, abundant micas

1564.63 -
1564.64m : 301

1564.77 -
1564.78m : 302

1564.75m : Yellow bentonite, disseminated pyrite and micas

1564.77m : Very fine sand lam, black organics, no shells, fish debris, mica rich

1565.78 -
1565.79m : 303

1565.98 - 1566.21m : Green/grey bentonites?, dk mica rich

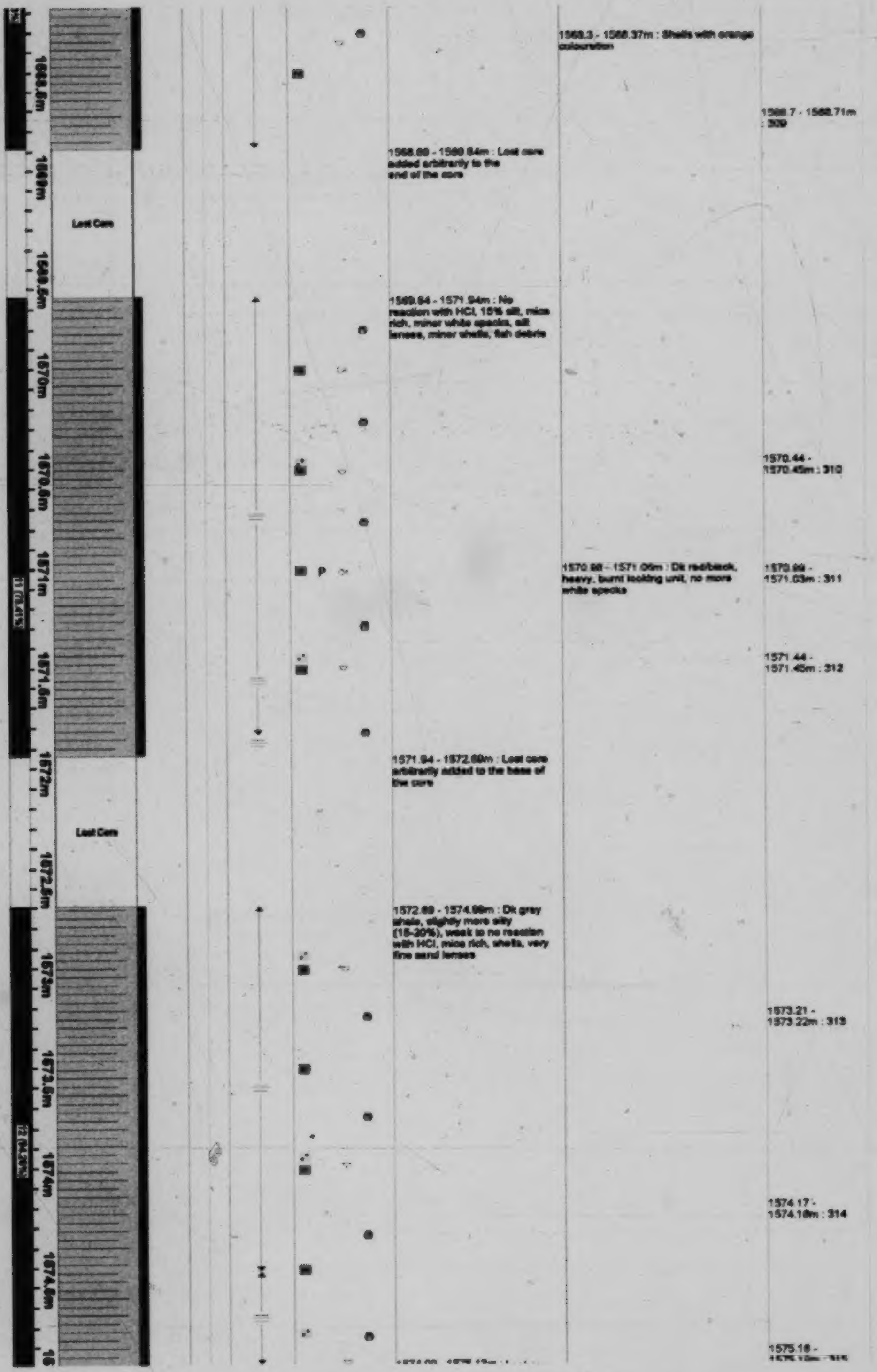
1565.98 -
1565.99m : 304
1566.08 -
1566.09m : 305
1566.19 - 1566.2m
: 306

1566.6 - 1568.68m : Fish debris, no reaction with HCl, minor specks, dk grey shale with minor silt lenses

1566.71 -
1566.72m : 307

1567.69 - 1567.7m
: 308

1568.3 - 1568.37m : Shells with orange colouration


1568.5m
1569m
Lost Core
1569.5m
1570m
1570.5m
1571m
1571.5m
1572m
Lost Core
1572.5m
1573m
1573.5m
1574m
1574.5m

1568.3 - 1568.37m : Shells with orange colouration

1568.7 - 1568.71m : 309

1568.89 - 1569.84m : Lost core added arbitrarily to the end of the core

1569.84 - 1571.94m : No reaction with HCl, 15% silt, mica rich, minor white specks, silt lenses, minor shells, fish debris

1570.44 - 1570.45m : 310

1570.98 - 1571.06m : Dk red/black, heavy, burnt looking unit, no more white specks

1570.99 - 1571.03m : 311

1571.44 - 1571.45m : 312

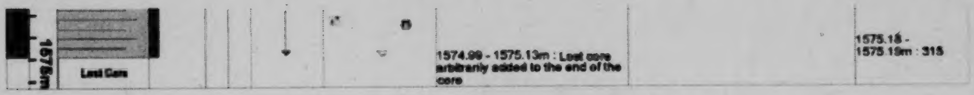
1571.94 - 1572.89m : Lost core arbitrarily added to the base of the core

1572.89 - 1574.98m : Dk grey shale, slightly more silty (15-20%), weak to no reaction with HCl, mica rich, shells, very fine sand lenses

1573.21 - 1573.22m : 313

1574.17 - 1574.18m : 314

1575.18 -



1575m
Lost Core

1574.99 - 1575.13m : Lost core arbitrarily added to the end of the core

1575.18 - 1575.19m : 318

**Well Information**

**Operator:** Husky Oil Operations Limited
**Well Name:** Husky Valhalla 16-22-75-8
**Location:**
**UWI:** 100162207508W600
**Pool:** Doe Creek 1 (190009)
**Field:** Valhalla (920)
**Province / State:** Alberta
**Country:** Canada

**Elevations**

**Reference:**
**Cut(-) / Fill(+):**
**K.B. to Ground:** m
**Ground:** 904.6 m
**Kelly Bushing:** 907.6 m
**Casing Flange:** m

**Surface Co - Ordinates**

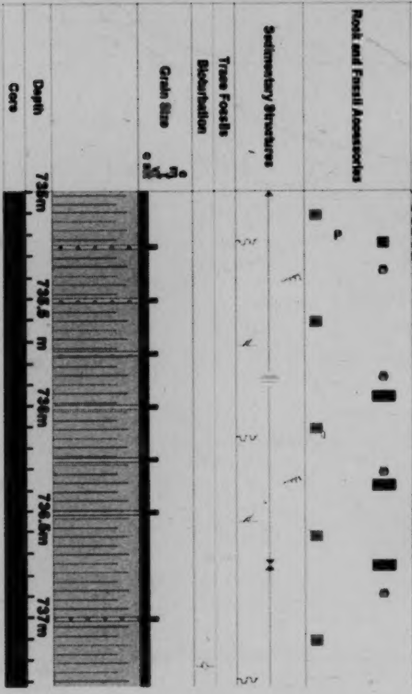
**Well Type:** Straight
**Longitude:** -119.137550
**Latitude:** 55.518915
**N / S Co - Ordinates:** 69.8
**E / W Co - Ordinates:** 49.7

**Bottom Hole Co - Ordinates**

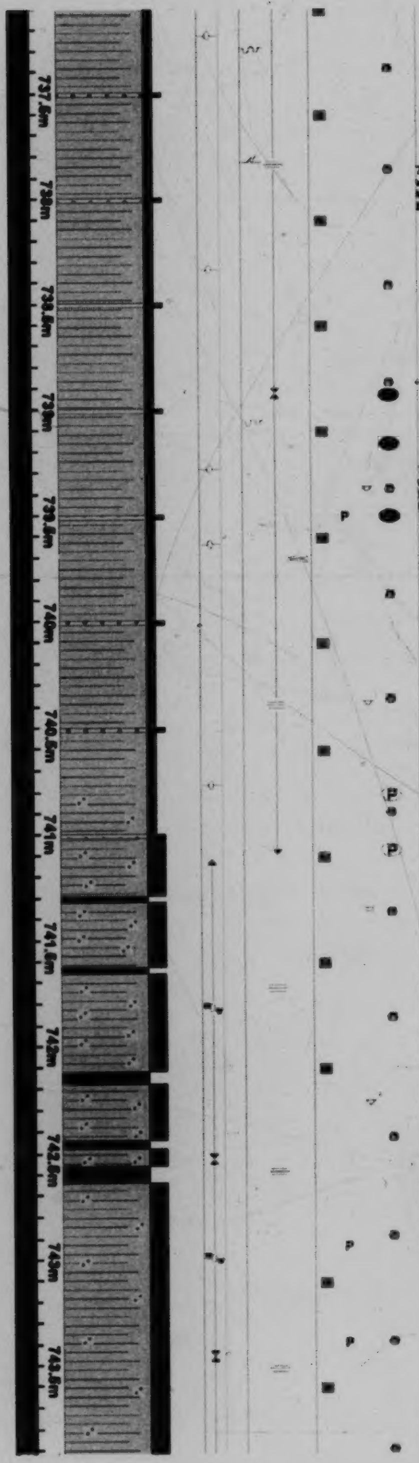
**Longitude:** -119.137550
**Latitude:** 55.518915
**N / S Co - Ordinates:** 69.8
**E / W Co - Ordinates:** 49.7

**Well Summary**

**Spud Date:** Oct 19, 1984
**Contractor:**
**TD Date:**
**Rig Release Date:** Oct 25, 1984


Core
Depth
Grain Size
Bioturbation
Trace Fossils
Sedimentary Structures
Rock and Fossil Accessories
735m
735.5 m
736m
736.5m
737m
P

| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 735 - 736.425m : No reaction with HCl, clays and silt lenses (20%), very fine sand lams and lenses (5-10%) up to 1cm with sharp bases, mica rich, loading, flame structures, small ripples | 735.2m : Concentration of pyrite<br>735.215 - 735.235m : Siderite | |
| | | 735.49 - 735.56m : 3921 |
| | 735.96m : Siderite lense | |
| | 736.355 - 736.38m : Siderite lense | |
| 736.425 - 737.85m : No reaction with HCl, sharp based very fine sand lams less abundant, lenses of siderite, clays with lenses of silt, quartz grains, flames, loading, bioturbation? | | 736.505 - 736.575m : 3922 |
| | 736.755 - 736.775m : Siderite lense | |



737.85 - 739.275m : No reaction with HCl, minor very fine sand lams/lenses (3%), silty shale, low bioturbation

739.275 - 740.7m : No reaction with HCl, 5-10% laminated very fine sand, sharp based, low bioturbation, shell fragments

740.7 - 742.125m : No reaction with HCl, shell fragments

742.5 - 743.55m : Mica rich, no reaction with HCl, 50% upper fine to lower medium sand, 50% shale intermixed, silt, siderite which has often been bioturbated, high bioturbation

737.6 - 737.85m : Dominantly silty shale, very few sand lams

738.9 - 739.275m : Siderite nodules, very fine sand and silt lams with sharp bases, loading

739.5m : Pyrite concentration, siderite nodules

739.7m : Cross lams

740.7 - 741.12m : Dominantly mica rich shale, clays, silt, very fine sand, laminated, pyrite nodules, low bioturbation, gradational base, end of SWS?

741.12m : High amount of bioturbation, start of Belle Fourche?, 50% fine sand, 50% shale completely intermixed, silt, no sedimentary structures can be seen anymore, siderite

741.29 - 741.32m : Siderite

741.83 - 741.88m : Siderite

742.125 - 742.175m : Upper very fine to lower medium sand

742.44 - 742.48m : Siderite

742.585 - 742.635m : Siderite

742.685m : Gradational downwards into 15-20% sand intermixed with shale

742.685 - 743.55m : Very little sedimentary structures can be seen, 20% fine sand completely intermixed with shale, high bioturbation, mica rich, pyrite concentrations, silt

743.55 - 744.28m : No reaction with HCl, sand and shale intermixed, gradational base

737.525 - 737.595m : 3923

738.425 - 738.495m : 3924

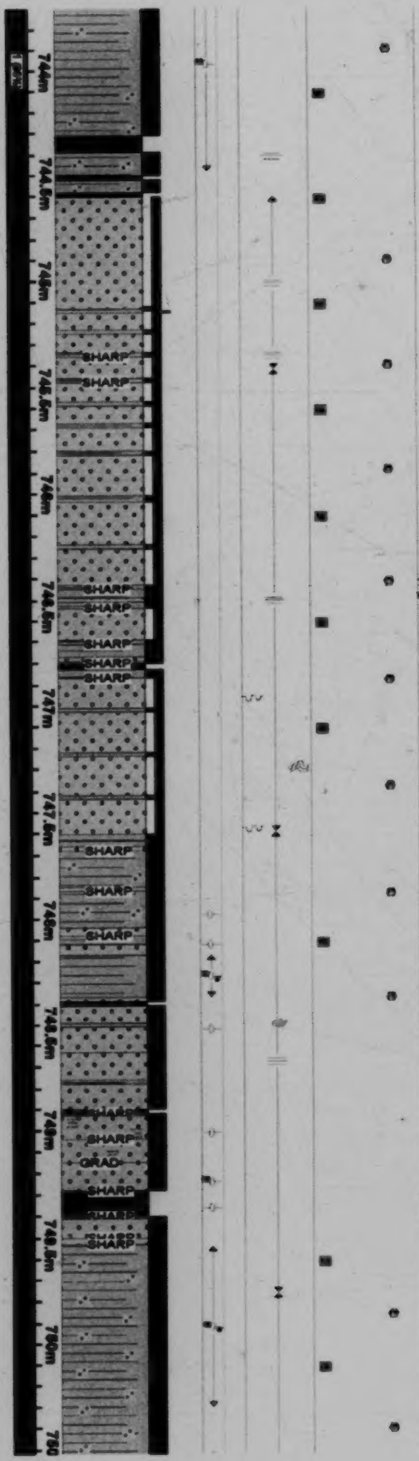
739.47 - 739.54m : 3925

740.465 - 740.535m : 3926

741.44 - 741.51m : 3927

742.47 - 742.54m : 3928

743.48 - 743.55m : 3929



746.4 - 747.825m : No reaction with HCl

747.825 - 748.25m : No reaction with HCl

749.25 - 750.675m : No reaction with HCl

744.28 - 744.48m : 50% sand, 50% shale, gradational base

744.31 - 744.39m : Siderite

744.48 - 744.6m : Coaly lams, siderite lams, intermixed calcareous fine white sand and shale lams

744.48 - 744.815m : Strong reaction with HCl, fine sand lams, planolites

744.815 - 745.025m : Oil stained sand, no reaction with HCl

745.025 - 745.13m : No reaction with HCl, fine sand

745.13 - 745.36m : Brown oil stained fine sand, parallel dk gray lams

745.36 - 745.475m : Sharp contacts, fine gray laminated sand

745.475 - 745.585m : Fine laminated oil stained sand

745.585 - 745.685m : Fine gray laminated sand

745.685 - 745.82m : Brown fine laminated oil stained sand

745.82 - 746.04m : Gray fine laminated sand

746.04 - 746.285m : Brown fine laminated oil stained sand

746.285 - 746.45m : Gray fine laminated sand, sharp basal contact

746.45 - 746.545m : Sharp top and basal contacts, mica rich shale, very fine sand lams

746.545 - 746.71m : Sharp top and basal contacts, fine sand with shale

746.71 - 746.87m : Sharp top and basal contacts, shale with very fine sand and siderite lams

746.87 - 747.64m : Very fine to fine sands, parallel shale lams, minor loading - deformation of lams, sharp basal contacts

747.64 - 747.68m : Mica rich, shale with sand lams, sharp basal contact

747.68 - 747.935m : Quartz rich sands and shale lams

747.93 - 748.04m : Fine sand 50%, 50% shale, parallel lams, soft sed deformation, low bioturbation

748.04 - 748.085m : Sand and shale lams, sharp based, no bioturbation

748.085 - 748.125m : Low bioturbation

748.125 - 748.185m : Fine sand

748.185 - 748.385m : 50% fine sand, 50% shale, highly bioturbated

748.385 - 748.63m : Low bioturbation, planolites, fine sand, shale lams, siderite

748.63 - 748.93m : No bioturbation, partially oil stained, minor lams, sand, siderite

748.93 - 749.04m : Planolites, 70% sand, 30% shale, sharp top and basal contacts

749.04 - 749.15m : Fine sand with thin shale lams, sharp top contact, gradational base

749.15 - 749.28m : 70% fine sand, 30% shale, increase in bioturbation, gradational top, sharp base

749.28 - 749.4m : Siderite, bioturbated, sharp top and basal contact

749.4 - 749.495m : Fine sand, shale lams, sharp top and sharp base

749.495 - 749.525m : Calcareous sand, sharp top and basal contacts

749.525 - 750.285m : Heavily bioturbated fine sand (50%), 50% fissile shale intermixed

750.285 - 750.675m : Rubble, intermixed shale and fine sand, some bioturbation?

744.48 - 744.55m : 3930

744.715 - 744.785m : 3931

745.475 - 745.545m : 3932

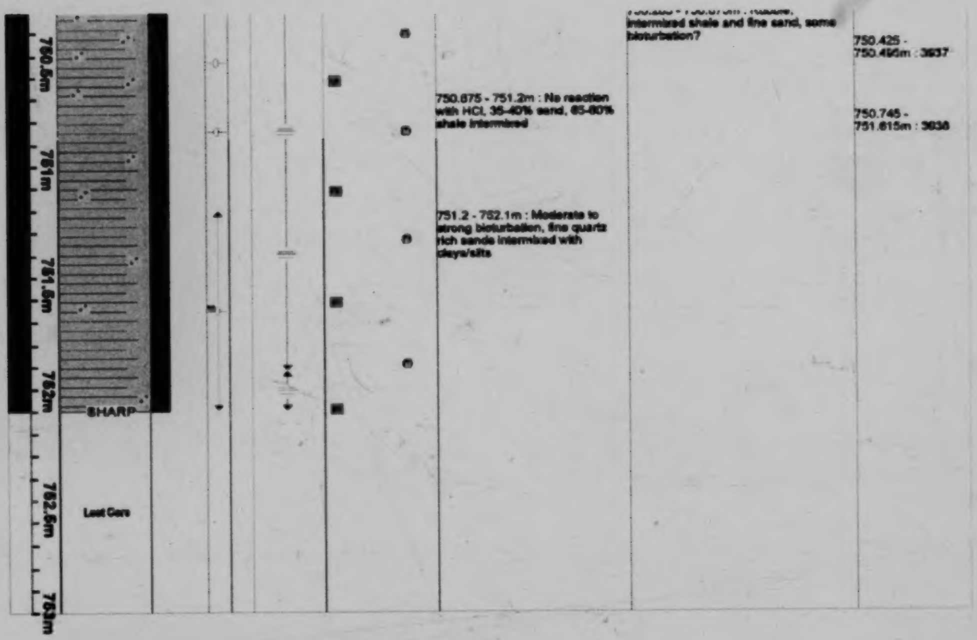
746.45 - 746.5m : 3933

747.44 - 747.49m : 3934

748.455 - 748.525m : 3935

749.45 - 749.5m : 3936

750.425 - 750.495m : 3937


750.5m
751m
751.5m
752m
752.5m
753m
SHARP
Lost Core
750.875 - 751.2m : No reaction with HCl, 35-40% sand, 65-60% shale intermixed
751.2 - 752.1m : Moderate to strong bioturbation, fine quartz rich sands intermixed with clays/silts
intermixed shale and fine sand, some bioturbation?
750.425 - 750.495m : 3637
750.745 - 751.615m : 3638

**00/16-22-075-08W6/0: Husky Valhalla 16-22-75-8**

*Core:* 735m – 752.1m

*Second White Specks interval from cross section:* 658m - ?

*Observations:*

The base of the core consists of a dark grey shale with fine sand lenses. There is moderate to strong bioturbation. There is no reaction with hydrochloric acid. Up the core, the percentage of sand increases, and siderite concretions are observed. Bioturbation is observed in many locations, as well as some loading and soft sediment deformation. In between 744m and 746m depth, oil staining is observed. Above this, there is approximately 50% sand, 50% shale with abundant bioturbation. Siderite and pyrite is observed. The percentage of sand decreases up section, along with the amount of bioturbation. There is no reaction with hydrochloric acid, however, ripples and soft sediment deformation becomes visible.

*Interpretation:*

It is not known from the geophysical logs whether or not this core lies within the Second White Specks Formation because the logs do not extend to the depth of the core. However, based on the core, this interval does not appear to be the Second White Specks interval. It appears more likely to be the Belle Fourche Formation, or a lower interval. The abundant bioturbation, the high percentage of sand and the presence of siderite resembles the Belle Fourche Formation. No white specks were observed, nor was there much reaction with hydrochloric acid, which would be expected of the Second White Specks.

## Well Information

**Operator:** Canadian Natural Resources Limited
**Well Name:** Rax Et Al 102 Ka Karr 6-30-64-1
**Location:**
**UWI:** 102063006401W600
**Pool:** Unknown
**Field:** Underfined - Alta (998)
**Province / State:** Alberta
**Country:** Canada

## Elevations

|  |  |  |  |
|---|---|---|---|
| **Reference:** |  | **Ground:** | 836.1 m |
| **Cut(-) / Fill(+):** |  | **Kelly Bushing:** | 840.5 m |
| **K.B. to Ground:** | m | **Casing Flange:** | m |

## Surface Co - Ordinates

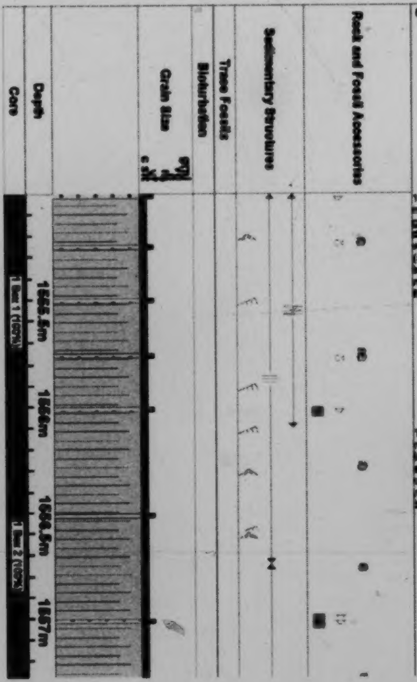
**Well Type:** Straight
**Longitude:** 118.138962
**Latitude:** 54.565516
**N / S Co - Ordinates:** 636.3
**E / W Co - Ordinates:** 706.0

## Bottom Hole Co - Ordinates

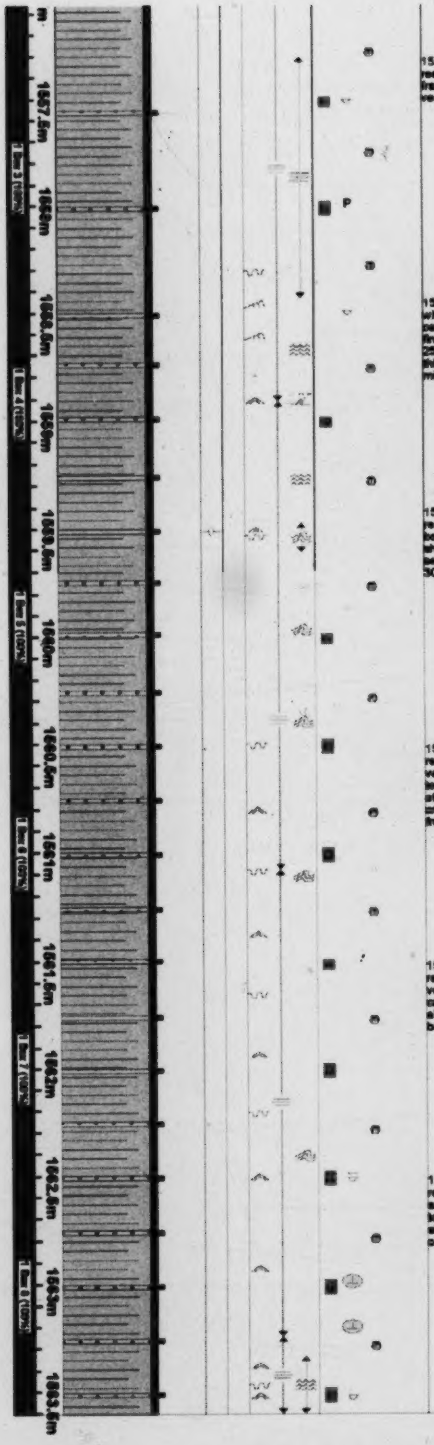
**Longitude:** 118.138962
**Latitude:** 54.565516
**N / S Co - Ordinates:** 636.3
**E / W Co - Ordinates:** 706.0

## Well Summary

**Spud Date:** Dec 30, 1993
**Contractor:**
**TD Date:**
**Rig Release Date:** Jan 10, 1994



| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 1555 - 1556.1m : Low to moderate reaction with HCl, dk gray shale, clays with discontinuous silty lams, parallel white very fine calcareous lams (approx. 5%), dominantly sharp top and base, lenticular bedding, mica rich, fish debris, some shell fragments | 1555.2m : Cross lams |  |
|  | 1555.5m : Ripples with cross lams |  |
|  | 1555.9m : Ripples with cross lams |  |
|  | 1556m : White specks? |  |
| 1556.1 - 1557.3m : Low to no reaction with HCl, abundance of lams decreasing downhole, sharp top and based white calcareous lams, shale is mica rich, abundant shelly fragments, black organics | 1556.1m : Ripples with cross lams |  |
|  | 1556.3m : Cross lams |  |
|  |  | 1556.41 - 1556.46 m : 3871 |
|  | 1556.6m : Cross lams, ripples |  |
|  | 1556.7m : White specks concentrated in lenses, yellow in colour |  |
|  | 1557m : Large Inoceramus shells (as large as the diameter of the core) |  |
|  | 1557.1m : Little to no reaction with HCl, aside from shells | 1557.25 - 1557.3m 3872 |
|  | 1557.1 - 1557.5m : No sandy lams, |  |



1557.3 - 1558.43m : Little to no reaction with HCl, a few shelly fragments, lenticular bedding, very fine sand lams

1558.43 - 1559.4m : No reaction with HCl, dk gray shale, non calcareous yellowish/beige very fine sand lams and lenses, 25-40% sand up to 1.5cm in thickness, sharp top and bases, mica rich, some wavy bedding

1559.4 - 1560.5m : Little to no reaction with HCl, dk gray shale, beige/yellow very fine sand lams, sharp tops and bases, soft sediment deformation, approx. 30% sand

1560.5 - 1561.5m : Weak reaction with HCl, dk gray shale, very fine sandy lams with sharp tops and bases, loading/pinching of sands, 25% sand, mica rich, cross lams, black organic fragments

1561.5 - 1562.5m : Weak to no reaction with HCl, micas, loading, very fine sand lams and lenses cross lams with truncated tops, abundant white specks on broken surfaces

1562.5 - 1563.6m : Generally no reaction with HCl, shale and sand lams, 25-30% sand, sharp top and bases, a few shells and shell fragments, cross lams cut off at the tops

large as the diameter of the core)

1557.1m : Little to no reaction with HCl, aside from shells

1557.1 - 1557.5m : No sandy lams, abundant silt lams, dominantly shale, some specks

1557.6 - 1558.43m : Shale with beige/gray non calcareous lams, very fine sand sized, sharp top and base

1557.9 - 1558.98m : Moderate reaction with HCl, very fine sand

1557.98m : Very fine sand lam with disseminated pyrite

1558.3m : Loading

1558.4m : Cross lams (thicken/thin), some sandy lams

1558.45m : Cross lams, ripples with cross lams

1558.8m : Ripple tops are cut off

1558.9m : Loading, flame structures, cross lams

1559.35 - 1559.44m : Calcareous very fine lams

1559.5m : Convoluted bedding, disturbed beds (small amount of bioturbation?), shell fragments, cross lams (truncated tops), loading

1561.1m : Convoluted bedding

1561.1 - 1561.5m : White specks concentrated in areas

1561.65m : Large lenses of white specks (medium sand sized), reaction with HCl

1562.4m : Convolute bedding

1562.98m : Calcareous nodule, reacts vigorously with HCl, approx. 4cm in diameter

1563.185m : Calcareous nodule

1563.18 - 1563.335m : Calcareous very fine sand lams

1563.335 - 1563.6m : Cross lams, wavy beds, sharp based, loading

1557.25 - 1557.3m : 3872

1557.39 - 1557.45 m : 3873

1557.89 - 1557.94 m : 3874

1558.4 - 1558.45 m : 3875

1559.33 - 1559.4m : 3876

1560.39 - 1560.46 m : 3877

1561.38 - 1561.45 m : 3878

1562.43 - 1560.5m : 3879

1563.17 - 1563.22 m : 3881

## Well Information

Operator: **Husky Oil Operations Limited**
Well Name: **Husky Et Al Skinner 7-33-52-15**
Location:
UWI: 102073305215W500
Pool: Second White Speck Undef (186098)
Field: Edson (320)
Province / State: Alberta
Country: Canada

## Elevations

| | | | |
|---|---|---|---|
| Reference: | | Ground: | 922.5 m |
| Cut(-) / Fill(+): | | Kelly Bushing: | 926.5 m |
| K.B. to Ground: | m | Casing Flange: | m |

## Surface Co - Ordinates

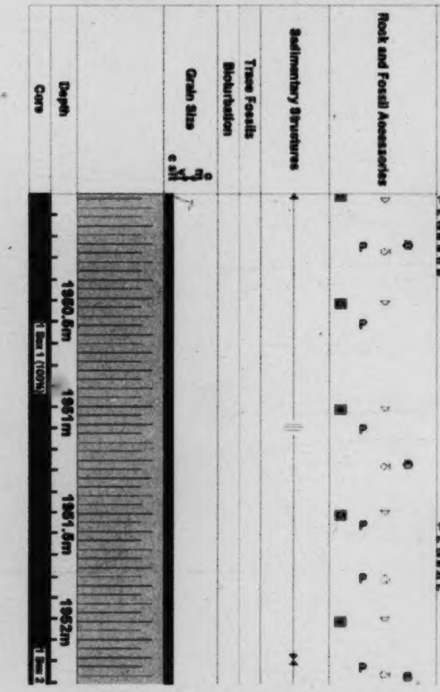
Well Type: Straight
Longitude: -116.145474
Latitude: 53.533243
N / S Co - Ordinates: 748.4
E / W Co - Ordinates: 490.1

## Bottom Hole Co - Ordinates

Longitude: -116.145474
Latitude: 53.533243
N / S Co - Ordinates: 748.4
E / W Co - Ordinates: 490.1

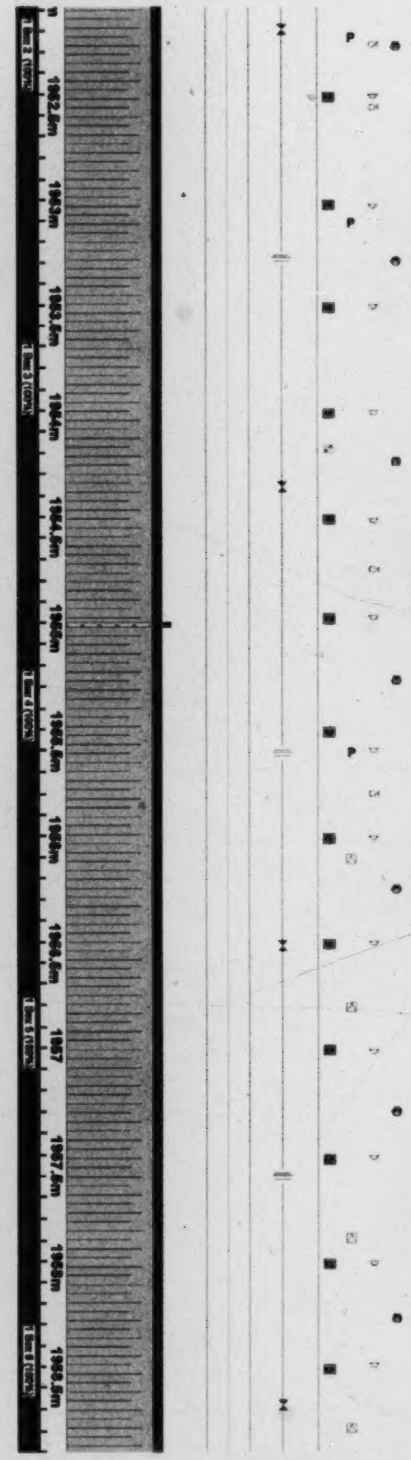
## Well Summary

| | | | |
|---|---|---|---|
| Spud Date: | Oct 30, 1988 | Contractor: | |
| TD Date: | | Rig Release Date: | Nov 26, 1988 |



Core
Depth
Grain Size
Bioturbation
Trace Fossils
Sedimentary Structures
Rock and Fossil Accessories
1950.5m
1951m
1951.5m
1952m
Box 1 (100%)
Box 2
P

| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 1950 - 1951.54m : Weak to moderate reaction with HCl, dk gray shale, <5% discontinuous silt lams, fissile, abundant shells, some black organic matter, fish debris, mica rich, no white specks seen | 1950.235m : Pyritized organic remains<br>1950.285 - 1951.54m : Abundant large Inoceramus shells and moulds, often pyritized | 1950.33 - 1950.35m : 438<br>1950.37 - 1950.42m : 439 |
| 1951.54 - 1953.08m : Weak to moderate reaction with HCl, dk gray shale, <5% discontinuous silt lams, pyritized shells, shells, black organic debris, fish debris, no white specks seen | 1951.8m : Pyritized gastropod<br>Pyritized shells | 1951.45 - 1951.5m : 440<br>1951.73 - 1951.74m : 441 |



1953.08 - 1954.82m : Moderate reaction with HCl, mica rich, discontinuous silty lams around 5%, shells

1954.82 - 1956.18m : Moderate reaction with HCl, minor silt <5%, mica, shells - Inoceramus and moulds, fish debris, black organics, no white specks seen

1956.18 - 1957.7m : Weak reaction with HCl, discontinuous silt lams <5%, some large Inoceramus, shelly material

1957.7 - 1958.24m : Low to no reaction with HCl, mica rich, large Inoceramus and shelly debris, discontinuous silt lams, a few quartz grains

Pyritised shells

1952.55m : Layer full of fish debris

1952.7m : Abundant brown/red specks

1953.1m : Shells partially pyritized

1954.17m : Upper very fine sand pockets

1955m : Discontinuous silt and very fine sand lams

1955.59m : Shelly debris layers

1955.6m : Fe staining? Yellow colour on broken surfaces

1955.6 - 1956.1m : Silt lams

1956.1m : Quartz grains

1956.8m : Some very fine sand sized quartz grains

1953.42 - 1953.47m : 443

1954.17 - 1954.22m : 444

1954.44 - 1954.51m : 445

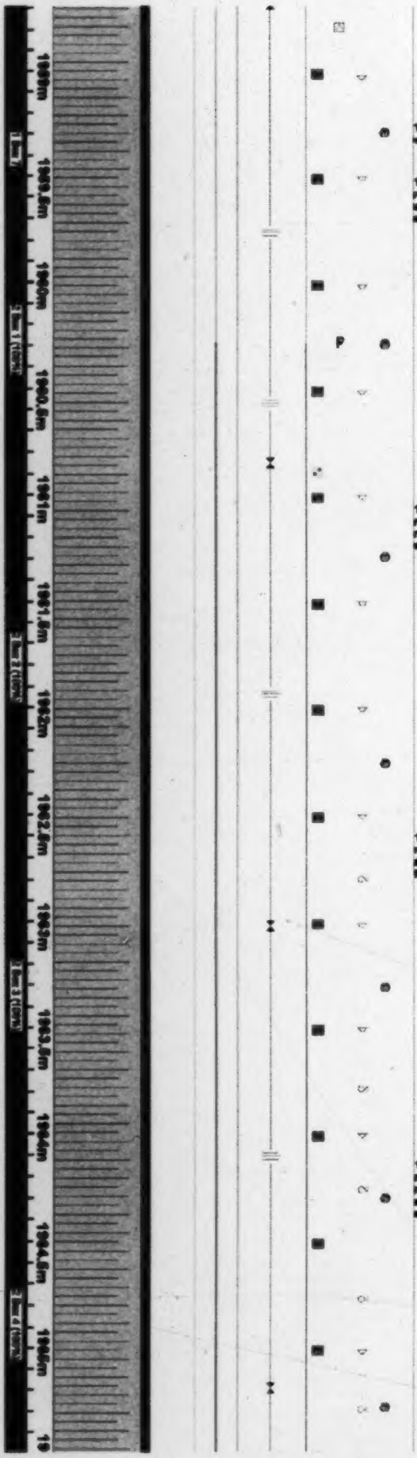
1955.47 - 1955.54m : 446

1955.72 - 1955.79m : 3959

1956.38 - 1956.43m : 447

1957.41 - 1957.46m : 448

1958.39 - 1958.45m : 448


1959m
1959.5m
1960m
1960.5m
1961m
1961.5m
1962m
1962.5m
1963m
1963.5m
1964m
1964.5m
1965m
P

1959.24 - 1959.5m : No reaction with HCl, mica rich, shells

1959.5 - 1961.04m : Weak to no reaction with HCl, mica rich, <5% silt, dominantly dk grey shale, abundant large Inoceramus

1961.04 - 1962.58m : Weak to no reaction with HCl, fissile, mica rich, discontinuous silty lams, shells

1962.58 - 1964.12m : Weak reaction with HCl, some smaller shells, mica rich, little silt <5%, fish debris

1964.12 - 1965.66m : Weak to moderate reaction with HCl, mica rich, <5% silt in lenses, shells, abundant fish debris, dk grey shale

1960.27m : Pyritized shells

1960.53m : Very fine white sand lenses

1960.66m : Very fine white sand lense

1963.5m : Small shell fragments

1959.4 - 1959.45m : 450

1960.5 - 1960.56m : 451

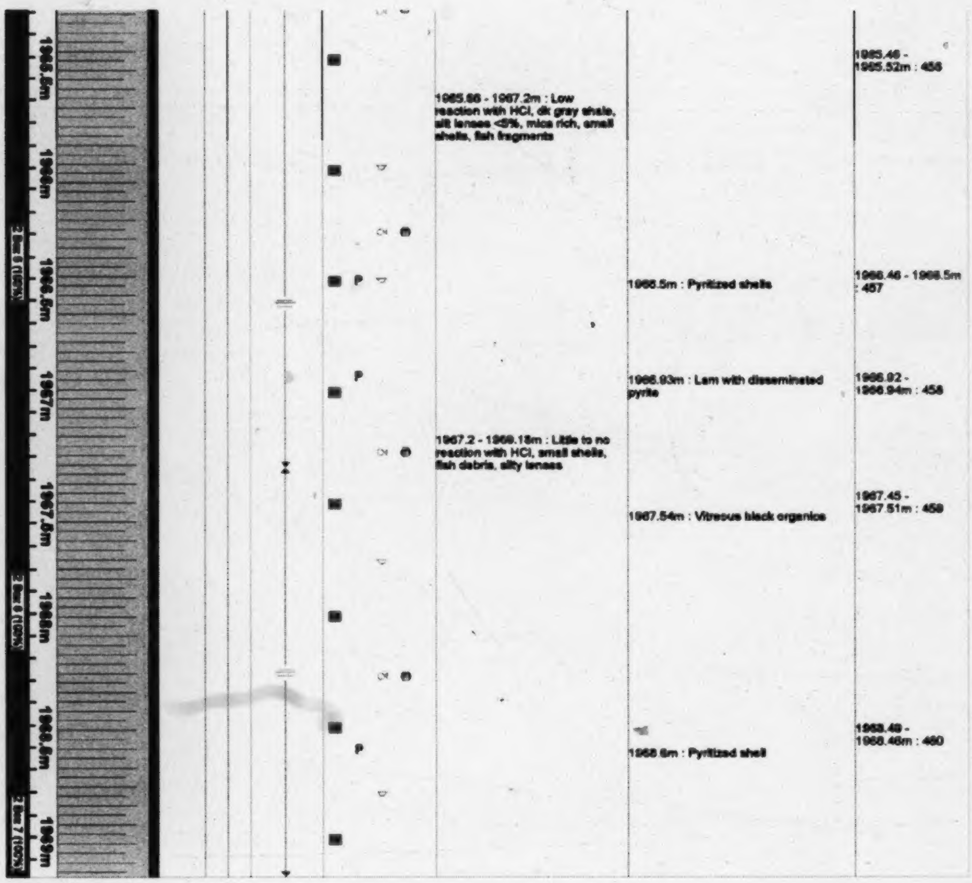
1961.42 - 1961.48m : 452

1962.39 - 1962.46m : 453

1963.48 - 1963.55m : 454

1964.02 - 1964.08m : 3990

1964.43 - 1964.49m : 455


1965.5m
1966m
1966.5m
1967m
1967.5m
1968m
1968.5m
1969m
2 Box 5 (100%)
2 Box 6 (100%)
2 Box 7 (100%)
P
P
P
1965.86 - 1967.2m : Low reaction with HCl, dk gray shale, silt lenses <5%, mica rich, small shells, fish fragments
1967.2 - 1969.18m : Little to no reaction with HCl, small shells, fish debris, silty lenses
1966.5m : Pyritized shells
1966.93m : Lam with disseminated pyrite
1967.54m : Vitreous black organics
1968.6m : Pyritized shell
1965.46 - 1965.52m : 456
1966.46 - 1966.5m : 457
1966.92 - 1966.94m : 458
1967.45 - 1967.51m : 459
1968.40 - 1968.46m : 460

## Well Information

| | |
|---|---|
| **Operator:** | Canadian Natural Resources Limited |
| **Well Name:** | Rax Et Al 102 KA Karr 16-18-64-2 |
| **Location:** | |
| **UWI:** | 102161806402W600 |
| **Pool:** | Unknown |
| **Field:** | Karr (515)A |
| **Province / State:** | Alberta |
| **Country:** | Canada |

## Elevations

| | | | |
|---|---|---|---|
| **Reference:** | | **Ground:** | 870.7 m |
| **Cut(-) / Fill(+):** | | **Kelly Bushing:** | 875.2 m |
| **K.B. to Ground:** | m | **Casing Flange:** | m |

## Surface Co - Ordinates

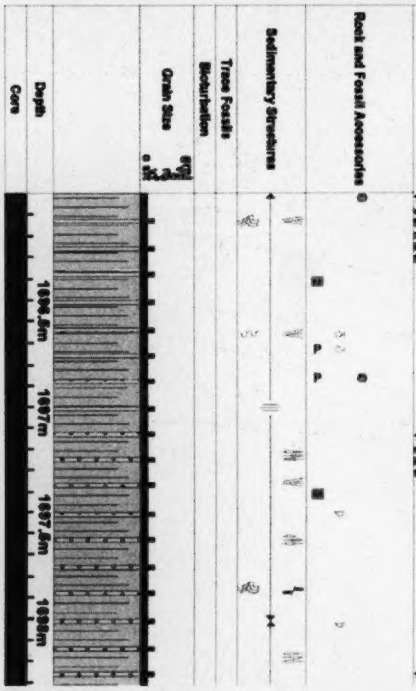
| | |
|---|---|
| **Well Type:** | Straight |
| **Longitude:** | 118.281382 |
| **Latitude:** | 54.541641 |
| **N / S Co - Ordinates:** | 395.1 |
| **E / W Co - Ordinates:** | 347.6 |

## Bottom Hole Co - Ordinates

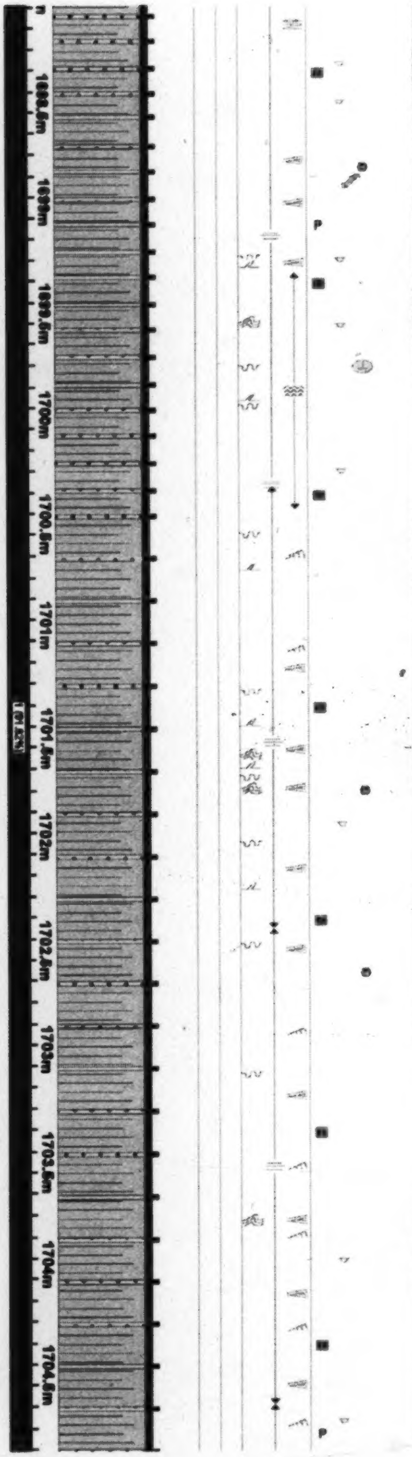
| | |
|---|---|
| **Longitude:** | 118.281382 |
| **Latitude:** | 54.541641 |
| **N / S Co - Ordinates:** | 395.1 |
| **E / W Co - Ordinates:** | 347.6 |

## Well Summary

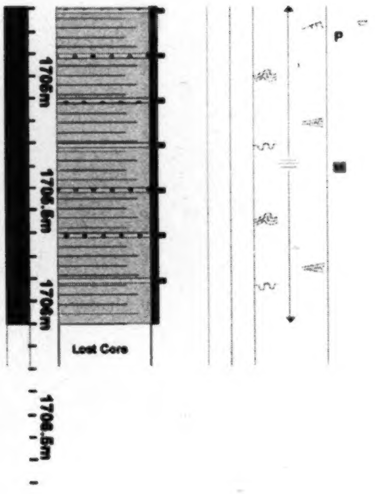
| | | | |
|---|---|---|---|
| **Spud Date:** | Dec 13, 1993 | **Contractor:** | |
| **TD Date:** | | **Rig Release Date:** | Dec 23, 1993 |



| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 1696 - 1697.12m : Weak reaction with HCl, sulphur smell, fissile, fine clays and silt lenses, mica rich, very fine white/gray sand lams with sharp tops and bases, fish fragments, black organics | Cross lams, tops are truncated, convoluted bedding | |
| | Lams up to 5mm in thickness, parallel lams | |
| | | 1696.48 - 1696.55m : 3910 |
| | 1696.65m : Fish fragments, cross lams, loading | |
| | 1696.72m : Lenses of silt, fish debris, black organics, pyrite | |
| | Pyrite in sand lams | |
| 1697.12 - 1698.24m : Weak reaction with HCl, 5-10% sand, lenticular bedding, a few shelly fragments | | |
| | 1697.35m : Yellow/white coloured specks, react with HCl, cross lams | |
| | | 1697.46 - 1697.53m : 3911 |
| | Thickening/thining lams | |
| | 1697.61 - 1697.895m : Convoluted beds, some soft sed. faulting | |
| 1698.24 - 1698.36m : Generally | | |



| | | |
|---|---|---|
| 1698.24 - 1699.36m : Generally weak reaction with HCl, clays with micas and silt lenses, shells and shell fragments | 1698.36m : Lams full of shelly debris | |
| | 1698.54m : Shells and specks | 1698.47 - 1698.54m : 3912 |
| | Cross lams | |
| | Cross lams | |
| | 1699.13m : Fine sand lams, disseminated pyrite in lams | |
| | 1699.27 - 1699.36m : Sands have a moderate reaction with HCl, cross lams, flame structures, loading, wavy bedding | |
| 1699.36 - 1700.48m : Weak to no reaction with HCl, 40% very fine sands lams with sharp tops and bases, 60% shale, wavy bedding, shelly fragments, silt lenses | 1699.43 - 1699.48m : Sands with shale lams | 1699.45 - 1699.52m : 3913 |
| | Lower fine, upper very fine sand | |
| | 1699.56 - 1699.63m : Very fine sand, convoluted bedding | |
| | 1699.785m : Calcareous nodule, cross lams, loading, wavy bedding | |
| | Cross lams, loading, flames, soft sed deformation | |
| | | 1700.41 - 1700.48m : 3914 |
| 1700.48 - 1701.6m : No reaction with HCl, dk gray shale, very fine sandy white lams (approx. 30%) with sharp tops and bases, ripples with truncated tops, loading, flame structures, silt lenses | | |
| | Yellowish/beige sands, cross lams | |
| 1701.5 - 1702.72m : No reaction with HCl, cross lams, yellowish/beige sand lams (30%), loading, flame structures, mica rich, shell fragments, silty lenses | 1701.6 - 1701.78m : Very fine steel gray sand, weak to moderate reaction with HCl, loading, flame structures, convolute bedding, cross lams, shelly fragments | 1701.55 - 1701.6m : 3915<br>1701.65 - 1701.72m : 3916 |
| | Sharp, distinct contacts, sharp tops and bases, loading, cross lams | 1702.44 - 1702.51m : 3917 |
| 1702.72 - 1703.84m : No reaction with HCl, very fine sand lams, cross lams, ripples with truncated tops, loading, silt lenses | | |
| | | 1703.43 - 1703.5m : 3918 |
| 1703.84 - 1704.96m : Weak to no reaction with HCl, sharp based very fine sand lams/lenses/ripples/cross lams, silt lenses, shell fragments | Convoluted bedding, lams thicken and thin, ripples, cross lams with truncated tops | |
| | | 1704.4 - 1704.47m : 3919 |
| | Concentration of pyrite | |


1705m
1705.5m
1706m
1706.5m
Lost Core
P
M

Concentration of pyrite

1704.96 - 1706.1m : Weak to no reaction with HCl, cross lams with truncated tops, convoluted beds, loading

1705.38 - 1705.44m : 3920

1706.1 - 1707m : Lost core arbitrarily added to the end of the core

**Well Information**

**Operator:** BP Canada Energy Company
**Well Name:** Amoco Pinenw 16-27 Ek-58-20
**Location:**
**UWI:** 102162705820W500
**Pool:** Elkton B (638002)
**Field:** Pine Creek (706)
**Province / State:** Alberta
**Country:** Canada

**Elevations**

| | | | |
|---|---|---|---|
| **Reference:** | | **Ground:** | 927.2 m |
| **Cut(-) / Fill(+):** | | **Kelly Bushing:** | 930.9 m |
| **K.B. to Ground:** | m | **Casing Flange:** | m |

**Surface Co - Ordinates**

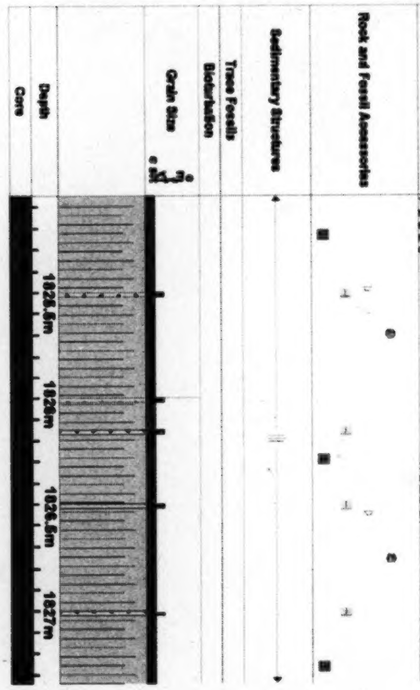
**Well Type:** Straight
**Longitude:** -116.877692
**Latitude:** 54.049053
**N / S Co - Ordinates:** 122.7
**E / W Co - Ordinates:** 233.6

**Bottom Hole Co - Ordinates**

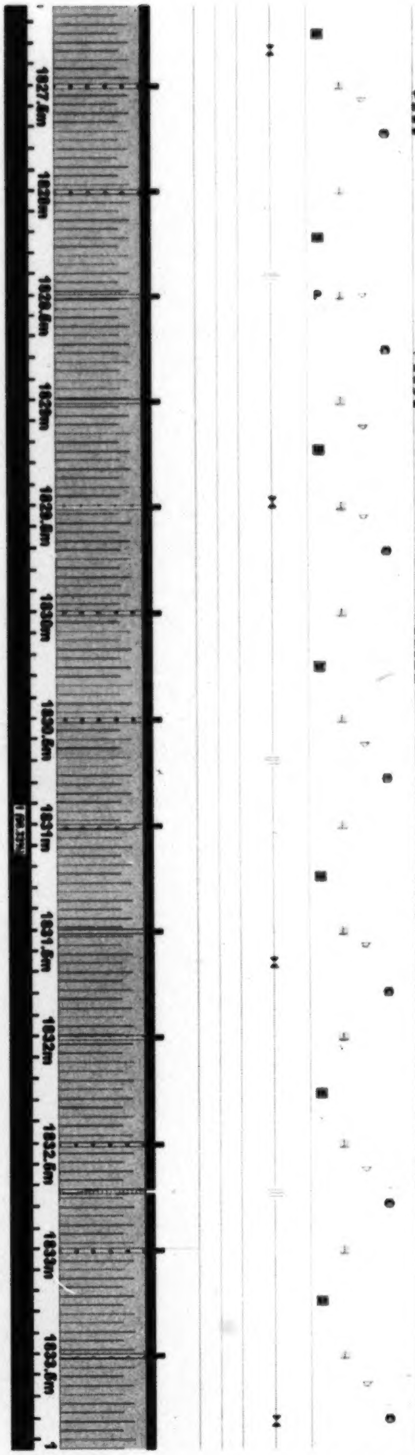
**Longitude:** -116.877692
**Latitude:** 54.049053
**N / S Co - Ordinates:** 122.7
**E / W Co - Ordinates:** 233.6

**Well Summary**

| | | | |
|---|---|---|---|
| **Spud Date:** | Nov 11, 1977 | **Contractor:** | |
| **TD Date:** | | **Rig Release Date:** | Dec 20, 1977 |



| General Description | Detailed Description | Geochem Sample |
|---|---|---|
| 1825.05 - 1826.3m : Moderate reaction with HCl, dk grey shale, silt lenses, minor shells, mica rich, very fine sand sized calcareous lams | | 1825.47 - 1825.53m : 3812 |
| 1826.3 - 1827.53m : Moderate to strong reaction with HCl, very fine beige sand sized calcareous lams, shells, silt lenses <5%, clays, mica rich | 1826.15m : 1mm thick beige very fine sand sized calcareous lam with undulatory boundaries | 1826.5 - 1826.56m : 3813 |



1827.53 - 1828.77m : Moderate to strong reaction with HCl, shells, silty lenses, very fine sand lams

1828.77 - 1830.01m : Weak reaction with HCl, many shells, shelly debris and imprints, clays with minor silt, silt lenses, mica rich

1830.01 - 1831.25m : Weak reaction with HCl (some lams react more vigorously than others), large Inoceramus imprints, abundant shells, silt lenses, dk gray shale, mica rich

1831.25 - 1832.49m : Weak reaction with HCl, clays with <5% silt lenses, shell imprints and fragments, fissile

1832.49 - 1833.73m : Weak reaction with HCl, mica rich, silt-lenses <5%, abundant shells and Inoceramus imprints, fissile

1833.73 - 1834.97m : Weak reaction with HCl, clays with minor silt lenses, mica rich, some shells, fissile, pyrite

1827.68m : Very fine sand and silty lams

1827.93 - 1828m : Very fine sand and silty lams

1828.26m : Very fine sand and silty lams

1828.5m : Pyritized shell

1828.66 - 1828.72m : Very fine sand and silty lams

1828.97m : Very fine sand and silty lams

1829.13m : Shelly debris layer

1830.63m : Silty lam

1832.51m : Brown/orange coloured specks

1832.72m : 2mm thick grey bentonite, disseminated pyrite

1827.41 - 1827.49m : 3814

1828.51 - 1828.56m : 3815

1829.07 - 1829.13m : 3816

1829.5 - 1829.55m : 3817

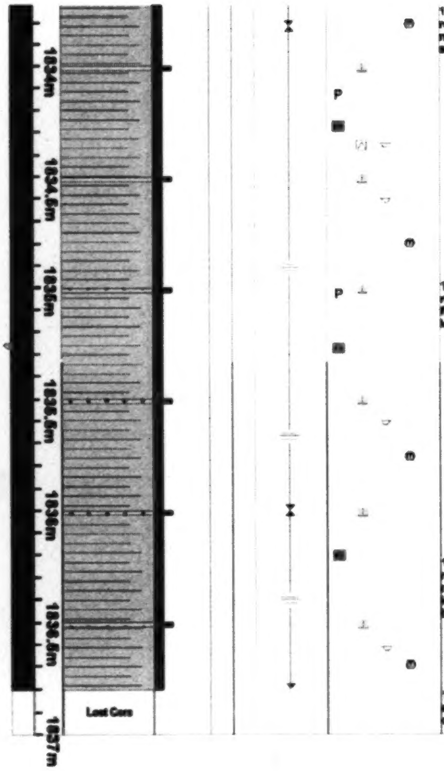
1830.49 - 1830.45m : 3818

1831.45 - 1831.5m : 3819

1832.33 - 1832.36m : 3820

1832.71 - 1832.73m : 3821

1833.44 - 1833.48m : 3822



| | | |
|---|---|---|
| 1833.73 - 1834.97m : Weak reaction with HCl, clays with minor silt lenses, mica rich, some shells, fissile, pyrite | Pyrite | |
| | 1834.35m : Quartz grains, shelly fragments | 1834.35 - 1834.49m : 3823 |
| 1834.97 - 1835.21m : Weak to moderate reaction with HCl, fissile, rubble, some shells, silt lenses, dk gray shale, mica rich | Pyrite, brown/orange specks | |
| | Brown/orange specks | |
| | | 1835.44 - 1835.49m : 3824 |
| 1835.21 - 1836.8m : Low to moderate reaction with HCl, mica rich, shells and shell imprints, silt lenses <5%, dk gray shale, a few brown/orange specks at the base | | 1836.27 - 1836.32m : 3826 |
| | | 1836.41 - 1836.46m : 3825 |
| 1836.8 - 1837m : Lost core arbitrarily added to the end of the core | | |

## 6.2 Micropaleontology Results

***Location:* 00/02-03-101-12W4/0 (*7BK03*)**

**Sample Number:** 6148

**Interval:** 99.59m - 99.64m

**Sample Description:**

Coarse-grained sandstone consisting mainly of angular quartz and some rounded chert, some pebbles, poorly sorted, calcareous cement. Very abundant phosphatic debris. Few *Inoceramus* prisms.

**Results:**

No foraminifera.

**Sample Number:** 6124

**Interval:** 80.275m - 80.345m

**Sample Description:**

Dark, organic-rich shale, strongly calcareous. Abundant shell fragments and a few *Inoceramus* prisms. Abundant phosphatic debris.

**Results:**

No foraminifera.

**Comments:**

No stratigraphic placement is suggested for either of these samples due to the lack of evidence.

***Location: 00/04-02-071-18W5/0***

**Sample Number:** 413

**Interval:** 762.22m - 762.275m

**Sample Description:**

Sandstone dominated by angular quartz grains, abundant mica, non-calcareous.

**Results:**

Barren of all fossils.

**Comments**:

The micropaleontology can not place this sample within a given formation due to a lack of evidence.

**Sample Number:** 4517

**Interval:** 768.67m - 768.74m

**Sample Description:**

Coarse-grained sandstone, calcareous cement, angular quartz grains, some micas. No phosphatic debris. No *Inoceramus* prisms.

**Results:**

Barren of all fossils.

**Comments**:

No stratigraphic placement is suggested.

***Location: 00/05-10-051-04W5/0***

**Sample Number:** 6011

**Interval:** 1299.09m - 1299.11m

**Sample Description:**

Silty shale with fine pyrite. Rare phosphatic debris. Rare *Inoceramus* prisms.

**Results:**

No planktic foraminifera. Questionable, poorly preserved agglutinated benthic foraminifera.

**Sample Number:** 4585

**Interval:** 1286.54m - 1286.56m

**Sample Description:**

Silty to sandy shale, rusty, calcareous white specks. Rare phosphatic debris.

**Results:**

No planktic foraminifera. Questionable, agglutinated benthic foraminifera.

**Sample Number:** 4550

**Interval:** 1256.56m - 1256.58m

**Sample Description:**

Silty shale, calcareous white specks. Common phosphatic debris.

**Results:**

No planktic foraminifera. Questionable agglutinated benthic foraminifera.

**Comments:**

For these three samples, it is difficult to attach a formation name to any of them. White specks were present in some of the samples, as well as some *Inoceramus*, which may be of Second White Specks origin. This could not, however, be confirmed.

***Location: 00/06-11-061-22W4/0***

**Sample Number:** 3979

**Interval:** 509.755m - 509.825m

**Sample Description:**

Coarse-grained sandstone with calcareous cement. No organic matter. No *Inoceramus* prisms, but rare calcareous shell pieces.

**Results:**

No foraminifera.

**Comments:**

May represent the base of the Carlile Formation, which is typically barren of foraminifera in southern and eastern Alberta.

***Location:* 00/06-12-098-13W4/0 (*7AS01*)**

**Sample Number:** 6071

**Interval:** 16.77m - 16.89m

**Sample Description:**

Medium Sandstone resembling a bioclastic layer, rounded quartz grains. Abundant coarse-grained phosphatic debris. Strongly calcareous. No organic matter is visible.

**Results:**

No foraminifera.

**Comments:**

No stratigraphic placement is suggested due to the lack of evidence for this sample. There may have been winnowing of the seafloor, however, and this may represent a bioclastic layer often associated with the base of the Second White Specks Formation.

**Sample Number:** 6064

**Interval:** 11.6m - 11.65m

**Sample Description:**

Black, organic-rich shale, visible organic matter. Abundant phosphatic debris. Abundant *Inoceramus* prisms.

**Results:**

Rare planktic foraminifera.

*Heterohelix globulosa*

*Hedbergella* spp.

**Comments:**

There are small planktic species found in this sample, indicating a sea level highstand. It may represent the First or the Second White Specks Formation.

***Location: 00/06-26-059-20W4/0***

**Sample Number:** 4510

**Interval:** 459.375m - 459.375m

**Sample Description:**

Black, organic-rich shale. Sand-fraction is mainly organic matter including abundant algal cysts. Abundant phosphatic debris. Very abundant *Inoceramus* prisms and fragments.

**Results:**

Abundant planktic foraminifera, no benthic foraminifera.

*Hedbergella loetterlei*

*Whiteinella aprica*

*Heterohelix globulosa*

*Hedbergella* spp. (unidentifiable species due to poor preservation)

**Comments:**

The species does confirm the Second White Specks Formation in this sample. The bottom waters were most likely anoxic because of the lack of benthic foraminifera, during a highstand and fully marine conditions.

**Sample Number:** 4511

**Interval:** 470.77m - 470.84m

**Sample Description:**

Silty calcareous shale, rusty within a coarsening upwards cycle. Abundant phosphatic debris. Abundant algal cysts. Abundant *Inoceramus* prisms.

**Results:**

Common planktic foraminifera, dominated by small test sizes. Rare agglutinated benthic foraminifera.

*Hedbergella loetterlei*

*Heterohelix globulosa*

*Trochammina rainwateri*

**Comments:**

The species does confirm the Second White Specks Formation in this sample. The low occurrence of *T. rainwateri* suggests movement towards a fully marine environment along with anoxic bottom waters.

***Location: 00/06-31-046-08W5/0***

**Sample Number:** 3983

**Interval:** 1821.565m - 1821.61m

**Sample Description:**

Silty rusty shale, slightly calcareous. Rare phosphatic debris. Few Inoceramus prisms.

**Results:**

No foraminifera.

**Sample Number:** 3986

**Interval:** 1803.15m - 1803.22m

**Sample Description:**

Silty shale, slightly calcareous. No *Inoceramus* prisms.

**Results:**

No foraminifera.

**Comment:**

The micropaleontology results can not confirm which formation the samples represent.

***Location: 00/06-35-059-21W4/0***

**Sample Number:** 3964

**Interval:** 469.45m - 469.52m

**Sample Description:**

Mainly sandstone dominated by quartz with calcareous cement. Common phosphatic debris. Coaly pieces. No *Inoceramus* prisms.

**Results:**

No foraminifera.

**Comments:**

No stratigraphic placement is suggested for this sample due to the lack of evidence.

***Location: 00/09-09-056-19W5/0***

**Sample Number:** 469

**Interval:** 2242.55m - 2242.62m

**Sample Description:**

Organic-rich shale, strongly calcareous. Abundant *Inoceramus* prisms.

**Results:**

Few planktic foraminifera showing various degrees of dissolution.

*Hedbergella* spp.

**Comments:**

The suggested placement for this sample is within the Second White Specks Formation due to the presence of the planktonic foraminifera.

**Sample Number:** 4522

**Interval:** 2270.87m - 2270.34m

**Sample Description:**

Silty shale, slightly calcareous. Rare *Inoceramus* prisms. Rare, poorly preserved agglutinated foraminifera.

**Results:**

Ataxophragmiidae, no genus or species level was identifiable.

**Comments:**

The suggested formation for this sample is the Second White Specks Formation based on the calcareous content, as well as the presence of *Inoceramus*.

***Location: 00/10-09-066-23W5/0***

**Sample Number:** 3860

**Interval:** 1283.48m - 1283.55m

**Sample Description:**

Sandstone, mainly angular quartz grains, reddish colour, coalified pieces, calcareous cement.

**Results:**

Barren of all fossils.

**Comments:**

There is no suggested stratigraphic placement for this sample.

***Location: 00/10-28-059-20W5/0***

**Sample Number:** 3829

**Interval:** 1877.28m - 1877.33m

**Sample Description:**

Rusty shale, slightly calcareous. No *Inoceramus* prisms. No phosphatic debris.

**Results:**

Rare, poorly preserved planktic foraminifera.

*Hedbergella* spp.

**Comments:**

This sample is confirmed Second White Specks Formation because of the planktic foraminifera.

***Location: 00/10-36-060-22W4/0***

**Sample Number:** 3948

**Interval:** 498.415m - 498.485m

**Sample Description:**

Mainly fine-grained sandstone dominated by quartz, slightly calcareous. Coaly fibers. Few *Inoceramus* prisms, shell fragments.

**Results:**

Few agglutinated benthic foraminifera.

*Verneuilinoides perplexus*

*Spiroplectammina ammovitrea*

*Trochammina rainwateri*

*Ammobaculites* sp.

**Comments :**

This sample is found at the top of the Second White Specks Formation and the base of the overlying Carlile Formation, where the environment returned the improvement of benthic oxygenated conditions.

***Location: 00/14-28-062-05W6/0***

**Sample Number:** 3883

**Interval:** 1876.32m - 1876.375m

**Sample Description:**

Sandstone, mainly quartz, calcareous cement. No visible organic matter. No phosphatic debris. No *Inoceramus* prisms.

**Results:**

No foraminifera.

**Sample Number:** 3893

**Interval:** 1882.125m - 1882.175m

**Sample Description:**

Sandstone, mainly quartz, slightly calcareous cement. No visible organic matter. No phosphatic debris. No *Inoceramus* prisms.

**Results:**

No foraminifera.

**Comments:**

There is no stratigraphic placement suggested for these samples due to the lack of evidence. It does not appear like the Second White Specks Formation.

***Location: 00/15-21-056-19W5/0***

**Sample Number:** 4524

**Interval:** 2372.31m - 2372.37m

**Sample Description:**

Silty Shale, slightly calcareous. Few *Inoceramus* prisms. Rare phosphatic debris.

**Results:** No foraminifera.

**Comments:**

Based on micropaleontology, no formation is suggested for this sample.

***Location: 00/16-12-046-03W5/0***

**Sample Number:** 4512

**Interval:** 1533.07m - 1533.08m

**Sample Description:**

Silty shale, slightly calcareous. Black coaly pieces. Calcite crystals. Few *Inoceramus* prisms.

**Results:**

Rare planktic foraminifera. Rare poorly preserved agglutinated foraminifera.

*Heterohelix globulosa*

*Trochammina* sp.

*Verneuilinoides* sp.

**Comments :**

The environment was not favourable for planktic forminifera. It is only represented by one species that can inhabit salinity fluctuations and the presence of the planktic taxon Heterohelix. This indicates the Second White Specks Formation.

**Sample Number:** 4513

**Interval:** 1540.65m - 1540.66m

**Sample Description:** Silty shale, strongly calcareous. Few *Inoceramus* prisms.

**Results:** Few planktic foraminifera.

*Heterohelix globulosa*

*Hedbergella* spp.

**Comments :**

The planktic species confirms the Second White Specks Formation.

***Location: 00/16-22-075-08W6/0***

**Sample Number:** 3931

**Interval:** 744.715m - 744.785m

**Sample Description:**

Sandstone, angular to rounded quartz grains, calcareous cement. No *Inoceramus* prisms. No phosphatic debris.

**Results:**

No foraminifera.

**Comments:**

No stratigraphic placement is suggested for this sample due to the lack of evidence.

***Location: 02/06-30-064-01W6/0***

**Sample Number:** 3870

**Interval:** 1555.61m - 1555.68m

**Sample Description:**

Silty to sandy shale, slightly calcareous, some coarse-grained quartz grains. Rare *Inoceramus* prisms. Some phosphatic debris.

**Results:**

Few poorly preserved agglutinated foraminifera.

*Psamminopelta* sp.

*Trochammina* sp.

Ataxophragmiidae

**Sample Number:** 3881

**Interval:** 1563.165m – 1563.215m

**Sample Description:**

Rusty, silty to sandy shale, slightly calcareous, abundant quartz. Common phosphatic debris. Rare, poorly preserved *Inoceramus* prisms.

**Results:**

Rare poorly preserved agglutinated foraminifera. Rare poorly preserved planktic foraminifera indicating dissolution of calcium carbonate.

*Hedbergella* sp. (1 specimen)

*Verneuilinoides* sp.

**Comments:**

No stratigraphic placement is suggested for these two samples due to the lack of evidence.

***Location: 02/07-33-052-15W5/0***

**Sample Number:** 3989

**Interval:** 1955.715m - 1955.785m

**Sample Description:**

Silty to sandy shale, slightly calcareous, no visible organic matter. Few *Inoceramus* prisms.

**Results:**

Few planktic foraminifera, some poorly preserved. Few agglutinated foraminifera.

*Heterohelix globulosa*

*Hedbergella sp.*

*Verneuilinoides perplexus*

*Saccammina alexanderi*

*Textularia* sp.

**Comments:**

The sample is from the base of the Second White Specks Formation, near the maximum flooding surface, based on the planktic species found in this sample.

**Sample Number:** 3990

**Interval:** 1964.02m - 1964.09m

**Sample Description:**

Silty shale, slightly calcareous. No Inoceramus prisms. No phosphatic debris.

**Results:**

Rare poorly preserved agglutinated foraminifera.

*Verneuilinoides perplexus*

**Comments:**

In this sample, there is a lack of planktic foraminifera in combination with the presence of *Verneuilinoides perplexus*. The sample most likely originated from the upper Belle Fourche Formation.

### ***Location: 02/16-18-064-02W6/0***

**Sample Number:** 3916

**Interval:** 1701.65m - 1701.72m

**Sample Description:**

Coarse-grained sandstone, angular quartz grains, black coaly pieces, calcareous cement, small metallic balls (siderite?), chert. Little phosphatic debris.

**Results:**

No foraminifera. 1 Diatom

**Comments:**

No stratigraphic placement is suggested for this sample due to the lack of evidence.

### ***Location: 02/16-27-058-20W5/0***

**Sample Number:** 3816

**Interval:** 1829.07m - 1829.13m

**Sample Description:**

Grey silty shale, slightly calcareous. Rare *Inoceramus* prisms. Recrystallized calcite crystals.

**Results:**

No Foraminifera.

**Comments:**

The Second White Specks Formation is suggested for this sample. Calcareous fossils were likely dissolved and there is a presence of *Inoceramus*.

### 6.3 Palynology Results

***Location:* 00/02-03-101-12W4/0 *(7BK03)***

**Sample Number:** 6131

**Interval:** 84.52m – 84.72m

**Results and Comments:**

*Dinogymnium spp.*
*D. sp. 1 McIntyre*
*D. cf. westralium*
*Heterosphaeridium difficile (A)*
*Chatangiella ditissima (C )*
*Isabelidinium acuminatum (C )*
*Diconodinium/ Laciniadinium spp. (A)*
*Spinidinium echinoideum*
*Alterbidinium minor*
*Trithyrodinium suspectum*
*Spongodinium cf. delitiense*
*Lebederocysta chlamydata*
*Dorocysta litotes*
*Palaeoperidinium pyrrophorum*

This core was difficult to date. Abundant dinocysts, especially *Dinogymnium* spp., suggests a Turonian (89.5m) age. The combination of *Dinogymnium* sp. 1 McIntyre, *Spongodinium* sp., and probably *S. delitiense*, however, may suggest an age of Santonian or younger. This date is uncertain and could be debated. The upper age limit is not easy to determine. In a limited study, McIntyre 1998 (in Schröder-Adams et al., 1998) found *Dinogymnium* sp. 1 in the First White Specks, but not in the underlying Medicine Hat Formation. It must be emphasized, however, that the sections studied did not extend very far into the lower unit. Therefore a Santonian – Early Campanian age is suggested, but can not be confirmed.

**Sample Number:** 6143

**Interval:** 97.8m – 97.9m

**Results and Comments:**

*Fromea glabella* (A)

*Leiosphaeridia* spp. (A)

*Isabelidinium globosum*

*Eurydinium glomeratum*

*Cribroperidinium exilicristatum*

*Palaeohystrichophora infusiorides*

A mid-Turonian age (lower Middle Second White Specks Formation) is assigned to this sample due to the presence of *Eurydinium glomeratum*, *Isabelidinium globosum* and *Florentinia cooksoniae*. The presence of the other palynomorphs suggests a restricted environment - possibly even sub-normal salinities.

***Location: 00/05-10-051-04W5/0***

**Sample Number:** 4567

**Interval:** 1272.69m – 1272.72

**Results and Comments:** Solid amorphous kerogen. Dinocysts are very rare and there are no good markers. The suggested age is no older than latest Albian.

*Palaeohystrichophora infusiorides*

*Surculosphaeridium longifurcatum*

***Location: 00/06-31-046-08W5/0***

**Sample Number:** 3985

**Interval:** 1812.14m – 1812.21m

**Results and Comments:**

*Eurydinium glomeratum*

*Isabelidinium globosum*

*Heterosphaeridium difficile*
*I. magnum*

Dinocysts are numerous in this sample, but most are poorly preserved. Sapropelic debris is also abundant. *Eurydinium glomeratum*, *Isabelidinium globosum* and *I. magnum* all indicate a similar age of Turonian and appear to be lower Middle Second White Specks Formation.

***Location: 00/10-22-047-03W4/0***

**Sample Number:** 235
**Interval:** 430.36m – 430.42m
**Results and Comments:** Amorphous, sapropelic debris dominates this sample and obscures some of the palynomorphs but dinocysts are abundant.

*Chatangiella ditissima (ER)*

*Florentinia cf. cooksoniae (ER)*

*Eurydinium glomeratum (A)*

*Isabelidinium globosum (C)*

*Fromea glabella (C )*
*Circulodinium distinctum*
*Odontochitina operculata*
*Spinidinium echinoideum*
*Trichodinium castaneum*
*Dinopteryagium cladoides*

The age was determined based on the presence of *Florentinia* cf. *cooksoniae*, a *Chatangiella ditissima*, multiple samples of *Isabelidinium globosum* which show an overlapping occurrence during the time of the middle Turonian. There are very few species of *Chatangiella* in this sample, which is characteristic of the upper Second White Specks, therefore, it is more likely to be a sample from the lower section of the Second White Specks. The data suggest that the sample is most likely lower middle Second White Specks.

***Location: 00/14-29-048-06W5/0***

**Sample Number:** 4514

**Interval:** 1547.45m – 1547.47m

**Results and Comments:**

*Eurydinium glomeratum*

*Isabelidinium globosum*

There is a poor assemblage in this sample. Due to the presence of *Eurydinium glomeratum* and *Isabelidinium globosum,* the sample is assigned a Turonian age, which appears to be the lower Middle Second White - similar to samples 235 and 3985.

## 6.4 Geochemistry Results

| Samples | Hole | Latitude | Longitude | From (m) | To (m) | Analysis Date |
|---|---|---|---|---|---|---|
| **201** | 00/06-26-059-20W4/0 | 54.126511 | -112.890603 | 458.480 | 458.535 | Dec. 2003 |
| **202** | 00/06-26-059-20W4/0 | 54.126511 | -112.890603 | 459.470 | 459.530 | Dec. 2003 |
| **203** | 00/06-26-059-20W4/0 | 54.126511 | -112.890603 | 460.470 | 460.525 | Dec. 2003 |
| **204** | 00/06-26-059-20W4/0 | 54.126511 | -112.890603 | 461.420 | 461.460 | Dec. 2003 |
| **206** | 00/06-26-059-20W4/0 | 54.126511 | -112.890603 | 462.460 | 462.515 | Dec. 2003 |
| **207** | 00/06-26-059-20W4/0 | 54.126511 | -112.890603 | 463.450 | 463.505 | Dec. 2003 |
| **208** | 00/06-26-059-20W4/0 | 54.126511 | -112.890603 | 464.440 | 464.490 | Dec. 2003 |
| **210** | 00/06-26-059-20W4/0 | 54.126511 | -112.890603 | 465.450 | 465.500 | Dec. 2003 |
| **212** | 00/06-26-059-20W4/0 | 54.126511 | -112.890603 | 466.430 | 466.490 | Dec. 2003 |
| **213** | 00/06-26-059-20W4/0 | 54.126511 | -112.890603 | 467.620 | 467.675 | Dec. 2003 |
| **214** | 00/06-26-059-20W4/0 | 54.126511 | -112.890603 | 468.435 | 468.490 | Dec. 2003 |
| **215** | 00/06-26-059-20W4/0 | 54.126511 | -112.890603 | 469.420 | 469.470 | Dec. 2003 |
| **216** | 00/06-26-059-20W4/0 | 54.126511 | -112.890603 | 469.770 | 469.800 | Dec. 2003 |
| **217** | 00/06-26-059-20W4/0 | 54.126511 | -112.890603 | 470.455 | 470.505 | Dec. 2003 |
| **218** | 00/06-26-059-20W4/0 | 54.126511 | -112.890603 | 471.490 | 471.530 | Dec. 2003 |
| **219** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 419.000 | 419.070 | Dec. 2003 |
| **219** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 419.000 | 419.070 | April 2004 |
| **220** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 419.980 | 420.050 | Dec. 2003 |
| **221** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 420.980 | 421.050 | Dec. 2003 |
| **222** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 421.560 | 421.580 | Dec. 2003 |
| **223** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 421.720 | 421.740 | Dec. 2003 |
| **224** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 421.950 | 422.020 | Dec. 2003 |
| **225** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 422.950 | 423.020 | Dec. 2003 |
| **226** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 423.940 | 424.000 | Dec. 2003 |
| **228** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 424.940 | 425.010 | Dec. 2003 |
| **229** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 425.970 | 426.040 | Dec. 2003 |
| **230** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 427.000 | 427.060 | Dec. 2003 |
| **232** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 427.850 | 427.920 | Dec. 2003 |
| **233** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 429.070 | 429.140 | Dec. 2003 |
| **234** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 430.080 | 430.150 | Dec. 2003 |
| **236** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 431.030 | 431.100 | Dec. 2003 |
| **237** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 431.990 | 432.060 | Dec. 2003 |
| **238** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 433.010 | 433.080 | Dec. 2003 |
| **239** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 434.050 | 434.120 | Dec. 2003 |
| **240** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 435.020 | 435.085 | Dec. 2003 |
| **241** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 436.140 | 436.210 | Dec. 2003 |
| **242** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 437.050 | 437.120 | Dec. 2003 |
| **243** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 436.670 | 436.740 | Dec. 2003 |
| **244** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 437.455 | 437.525 | Dec. 2003 |
| **245** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 438.350 | 438.410 | Dec. 2003 |
| **246** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 439.480 | 439.550 | Dec. 2003 |
| **247** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 440.460 | 440.530 | Dec. 2003 |
| **249** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 441.440 | 441.510 | Dec. 2003 |
| **250** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 442.450 | 442.510 | Dec. 2003 |
| **251** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 443.470 | 443.520 | Dec. 2003 |

| Samples | Probability of Fm | Formation | Sample Description |
|---|---|---|---|
| 201 | Probable | Second White Specks | Dk grey shale, silt, a few white specks, organic fragments |
| 202 | Known | Second White Specks | Dk grey shale, some silt |
| 203 | Known | Second White Specks | Dk grey shale with abundant shells |
| 204 | Known | Second White Specks | Dk grey shale (white specks, silty lams) with bentonite + pyrite - thin section, test bentonites |
| 206 | Known | Second White Specks | Dk grey shale, shell fragments, silt |
| 207 | Known | Second White Specks | Shale and bentonite with pyrite, some silt and micas – thin section as well |
| 208 | Known | Second White Specks | Dk grey shale, a few white specks, fissile, some silt |
| 210 | Known | Second White Specks | Shell layer - thin section |
| 212 | Known | Second White Specks | Dk grey shale, silt |
| 213 | Known | Second White Specks | Dk grey shale, shell fragments, some silt, fish debris |
| 214 | Known | Second White Specks | Dk grey shale, silty |
| 215 | Known | Second White Specks | Dk grey shale, white specks, some silt |
| 216 | Known | Second White Specks | Pyrite nodule |
| 217 | Known | Second White Specks | Dk grey shale, white specks, shells |
| 218 | Known | Second White Specks | Dk grey shale, micas, fish debris, some silt |
| 219 | Known | Belle Fourche (or underlying unit) | Dk grey shale, silty pockets |
| 219 | Known | Belle Fourche (or underlying unit) | Dk grey shale, silty pockets |
| 220 | Known | Belle Fourche (or underlying unit) | Dk grey shale, some shelly fragments, silty pockets/lams |
| 221 | Known | Belle Fourche (or underlying unit) | Dk grey shale + white sand lams |
| 222 | Known | Belle Fourche (or underlying unit) | Shell/fish debris |
| 223 | Known | Belle Fourche (or underlying unit) | Bentonite |
| 224 | Known | Belle Fourche (or underlying unit) | Dk grey shale, shell fragments, some silt |
| 225 | Known | Belle Fourche (or underlying unit) | Dk grey shale, silty/sandy lams |
| 226 | Known | Belle Fourche (or underlying unit) | Dk grey shale, silty/sandy lams |
| 228 | Known | Belle Fourche (or underlying unit) | Dk grey shale, silty/sandy pockets |
| 229 | Known | Belle Fourche (or underlying unit) | Dk grey shale, silty/sandy lams |
| 230 | Known | Second White Specks | Start of SWS (?) Dk Grey shale, sandy ripples/lams, organic fragments |
| 232 | Known | Second White Specks | Shale with coarser grains (sand sized lams), white specks, shelly fragments, |
| 233 | Known | Second White Specks | Dk grey shale, sandy/silty lams, white specks |
| 234 | Known | Second White Specks | Dk grey shale, silt lams, shelly fragments, white specks |
| 236 | Known | Second White Specks | Dk grey shale, silty lams, shells, white specks |
| 237 | Known | Second White Specks | Dk grey shale, organic fragments, white coloured sand lams |
| 238 | Known | Second White Specks | Dk grey shale, white specks, bone fragments, silt lams |
| 239 | Known | Second White Specks | Dk grey shale, silty, abundant white specks |
| 240 | Known | Second White Specks | Dk grey shale, abundant white specks |
| 241 | Known | Second White Specks | Dk grey shale, minor white specks, silty lams |
| 242 | Known | Second White Specks | Dk grey shale (overlap with next box, see log - core 3, box 7/7), shell, bone fragments, silt |
| 243 | Known | Second White Specks | Dk grey shale (overlap with previous box, see log – core 4, box 1/6), silty, some white specks visible |
| 244 | Known | Second White Specks | Dk grey shale, very fissile, white specks present, silty |
| 245 | Known | Second White Specks | Dk grey shale, very fissile |
| 246 | Known | Second White Specks | Dk grey shale, fissile, some white specks |
| 247 | Known | Carlile (or overlying shale) | Dk grey shale, very platey, micas, shelly fragments, minor silt |
| 249 | Known | Carlile (or overlying shale) | Dk grey shale, silty/sandy lams, micas |
| 250 | Known | Carlile (or overlying shale) | Broken fragments of shale, some shelly fragments, some silt |
| 251 | Known | Carlile (or overlying shale) | Broken fragments of shale, silty pockets, some white specks |

***Analysis: GROUP 1F1 - 1.00 GM***

| **Element** | **Ag** | **Al** | **As** | **Au** | **B** | **Ba** | **Be** | **Bi** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** | **0.1** | **0.02** |
| **Samples** | **ppb** | **%** | **ppm** | **ppb** | **ppm** | **ppm** | **ppm** | **ppm** |
| **201** | 543 | 0.73 | 41 | 1.4 | 16 | 64.7 | | 0.25 |
| **202** | 581 | 0.61 | 44.6 | 1.9 | 17 | 72.1 | | 0.35 |
| **203** | 376 | 0.71 | 28.8 | 0.9 | 17 | 78.1 | | 0.25 |
| **204** | 351 | 0.86 | 48.7 | 1.4 | 17 | 39.5 | | 0.28 |
| **206** | 341 | 0.72 | 38.8 | 0.9 | 17 | 41.9 | | 0.28 |
| **207** | 289 | 0.82 | 56.8 | 0.9 | 14 | 27.5 | | 0.28 |
| **208** | 489 | 0.61 | 34.4 | 1.3 | 14 | 58.3 | | 0.25 |
| **210** | 433 | 0.77 | 32.5 | 1.2 | 19 | 37.6 | | 0.32 |
| **212** | 358 | 0.92 | 20.7 | 0.9 | 24 | 46.1 | | 0.31 |
| **213** | 326 | 0.92 | 27.2 | 0.6 | 21 | 42.6 | | 0.33 |
| **214** | 332 | 0.9 | 21.8 | < .2 | 20 | 53.9 | | 0.33 |
| **215** | 348 | 0.89 | 22.4 | 1 | 19 | 55.3 | | 0.36 |
| **216** | 391 | 0.91 | 22.6 | 1.2 | 19 | 54.6 | | 0.34 |
| **217** | 380 | 0.72 | 28.6 | 1.1 | 18 | 53.5 | | 0.27 |
| **218** | 330 | 0.81 | 39.4 | 0.8 | 17 | 37.4 | | 0.29 |
| **219** | 407 | 1.32 | 20.7 | 1.9 | 17 | 63.4 | | 0.66 |
| **220** | 329 | 1.15 | 14.2 | 1 | 18 | 88.4 | | 0.55 |
| **221** | 372 | 0.8 | 25.4 | 1.4 | 14 | 72.7 | 0.6 | 0.41 |
| **222** | 217 | 1.18 | 18.6 | 1.7 | 14 | 170.4 | | 0.22 |
| **223** | 309 | 1.15 | 21.2 | 2 | 13 | 64.8 | 0.8 | 0.42 |
| **224** | 394 | 1.18 | 24 | 1.4 | 13 | 54.7 | | 0.47 |
| **225** | 380 | 0.84 | 23.2 | 1.7 | 12 | 76.1 | 0.5 | 0.49 |
| **226** | 398 | 1.24 | 30.2 | 1 | 10 | 37 | | 0.44 |
| **228** | 426 | 0.82 | 32.3 | 1.9 | 13 | 56.8 | 0.8 | 0.52 |
| **229** | 421 | 1.11 | 33.3 | 0.9 | 15 | 43.3 | | 0.47 |
| **230** | 255 | 2.13 | 24.7 | 0.6 | 24 | 71.3 | 1.1 | 0.25 |
| **232** | 285 | 0.52 | 16.9 | 0.8 | 7 | 125.4 | | 0.15 |
| **233** | 394 | 0.58 | 26 | 1.5 | 13 | 139.7 | 0.6 | 0.23 |
| **234** | 426 | 0.58 | 26.7 | 1 | 10 | 145.1 | | 0.22 |
| **236** | 400 | 0.52 | 27 | 1.3 | 14 | 126.4 | 0.5 | 0.23 |
| **237** | 284 | 0.47 | 22 | 0.2 | 9 | 115.4 | | 0.16 |
| **238** | 458 | 0.72 | 30.6 | 0.7 | 15 | 129.8 | 0.8 | 0.31 |
| **239** | 306 | 0.62 | 28.6 | 0.3 | 12 | 122.7 | | 0.21 |
| **240** | 512 | 0.57 | 37.5 | 1.3 | 13 | 123 | 0.8 | 0.31 |
| **241** | 401 | 0.58 | 28.8 | 1.3 | 15 | 115.4 | | 0.21 |
| **242** | 351 | 0.73 | 26.5 | 1.4 | 17 | 91.5 | 0.6 | 0.32 |
| **243** | 367 | 0.9 | 21.4 | 1.8 | 14 | 69.7 | | 0.68 |
| **244** | 390 | 0.65 | 27.1 | 0.3 | 11 | 76.3 | | 0.3 |
| **245** | 380 | 0.8 | 23.7 | 0.9 | 13 | 54.8 | | 0.31 |
| **246** | 235 | 0.83 | 12 | 1.5 | 17 | 96.5 | 0.7 | 0.34 |
| **247** | 577 | 0.8 | 38.4 | 1.9 | 15 | 65.3 | | 0.43 |
| **249** | 822 | 1.09 | 38.1 | 3.1 | 18 | 45.1 | 1 | 0.58 |
| **250** | 86 | 1.44 | 7.2 | < .2 | 18 | 63.4 | | 0.54 |
| **251** | 147 | 1.01 | 10.8 | 0.2 | 15 | 86.4 | 0.5 | 0.55 |

| Element<br>LDL<br>Samples | Ca<br>0.01<br>% | Cd<br>0.01<br>ppm | Ce<br>0.1<br>ppm | Co<br>0.1<br>ppm | Cr<br>0.5<br>ppm | Cs<br>0.02<br>ppm | Cu<br>0.01<br>ppm | Fe<br>0.01<br>% |
|---|---|---|---|---|---|---|---|---|
| **201** | 7.5 | 4.26 | | 24.1 | 19.5 | | 53.65 | 3.27 |
| **202** | 8.51 | 3.91 | | 24.3 | 18.8 | | 56.56 | 3.33 |
| **203** | 6.02 | 2.4 | | 17.2 | 18.2 | | 43.64 | 2.78 |
| **204** | 3.27 | 2.48 | | 16.5 | 13.5 | | 50.92 | 3.78 |
| **206** | 3.06 | 2.34 | | 18.4 | 16.6 | | 43.19 | 3.32 |
| **207** | 2.96 | 1.77 | | 13.8 | 13.8 | | 43.35 | 4.14 |
| **208** | 6.37 | 3.68 | | 23.4 | 18.2 | | 64.85 | 3.76 |
| **210** | 2.31 | 2.87 | | 21 | 20.5 | | 59.65 | 3.51 |
| **212** | 1.6 | 1.91 | | 16 | 28.1 | | 51.73 | 3.21 |
| **213** | 1.69 | 1.96 | | 14.2 | 23.6 | | 48.13 | 3.3 |
| **214** | 2.43 | 1.36 | | 15.2 | 23.4 | | 50.86 | 3.07 |
| **215** | 2 | 1.25 | | 14.3 | 22.6 | | 51.89 | 2.99 |
| **216** | 2.2 | 1.39 | | 13.3 | 23.7 | | 55.69 | 3.1 |
| **217** | 4.48 | 2.41 | | 17.2 | 18.8 | | 49.96 | 3.44 |
| **218** | 3.06 | 1.93 | | 17.1 | 18.8 | | 45.08 | 3.66 |
| **219** | 0.43 | 0.65 | | 8.5 | 17.2 | | 59.94 | 2.62 |
| **220** | 0.4 | 0.53 | | 8.1 | 15.2 | | 55.18 | 2.07 |
| **221** | 3.72 | 0.8 | 26.5 | 9.6 | 10.4 | 0.77 | 48.59 | 2.76 |
| **222** | 14.65 | 0.66 | | 6.7 | 10.9 | | 29.54 | 2.01 |
| **223** | 0.77 | 0.67 | 17.6 | 9.3 | 10.3 | 0.6 | 42.35 | 2.36 |
| **224** | 0.99 | 0.96 | | 10 | 15.3 | | 60.1 | 2.68 |
| **225** | 0.69 | 0.92 | 20.6 | 10.1 | 11.2 | 0.84 | 58.7 | 2.39 |
| **226** | 1.28 | 1.15 | | 10.5 | 12.7 | | 49.56 | 2.92 |
| **228** | 1.5 | 1.15 | 22.2 | 11.3 | 11.1 | 0.73 | 57.03 | 2.81 |
| **229** | 1.23 | 1.32 | | 11 | 14.6 | | 58.09 | 2.91 |
| **230** | 5.01 | 2.67 | 313.3 | 7.1 | 14.6 | 0.46 | 29.15 | 2.03 |
| **232** | 15.04 | 1.82 | | 9.4 | 9.4 | | 30.1 | 1.62 |
| **233** | 9.29 | 2.54 | 22.3 | 12 | 12.4 | 0.61 | 39.73 | 2.2 |
| **234** | 9.8 | 2.53 | | 14.4 | 12 | | 43.37 | 2.24 |
| **236** | 8.62 | 2.72 | 15.3 | 14.2 | 13.3 | 0.62 | 42.96 | 2.38 |
| **237** | 15.1 | 1.5 | | 10.1 | 7.8 | | 29.39 | 2.13 |
| **238** | 7.04 | 3.43 | 21.6 | 14.6 | 15.6 | 0.56 | 48.68 | 2.32 |
| **239** | 9.14 | 1.83 | | 14.9 | 12.6 | | 40.73 | 2.56 |
| **240** | 8.2 | 2.92 | 16.2 | 20.5 | 14.1 | 0.64 | 58.25 | 3.35 |
| **241** | 7.93 | 2.51 | | 16.9 | 15 | | 47.87 | 2.56 |
| **242** | 3.47 | 1.38 | 15.3 | 16.9 | 18.1 | 0.9 | 66.05 | 2.68 |
| **243** | 3.55 | 1.72 | | 17.6 | 25.6 | | 139.97 | 2.98 |
| **244** | 5.78 | 2.26 | | 20.7 | 17.6 | | 64.25 | 3.78 |
| **245** | 4 | 2.53 | | 18.5 | 21.8 | | 62.16 | 3.43 |
| **246** | 1.51 | 0.64 | 23.3 | 13.9 | 34.4 | 1.05 | 87.42 | 2.26 |
| **247** | 5.76 | 3.09 | | 20.9 | 20 | | 69.11 | 3.46 |
| **249** | 1 | 3.13 | 61.1 | 20.3 | 21 | 0.87 | 82.45 | 3.66 |
| **250** | 0.27 | 0.18 | | 14.7 | 24.8 | | 28.39 | 2.8 |
| **251** | 0.34 | 0.62 | 49.2 | 15.7 | 14.7 | 1.16 | 35.06 | 2.7 |

| **Element** | **Ga** | **Ge** | **Hf** | **Hg** | **In** | **K** | **La** | **Li** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **0.02** | **5** | **0.02** | **0.01** | **0.5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppb** | **ppm** | **%** | **ppm** | **ppm** |
| **201** | 3.6 | | | 249 | | 0.22 | 7.6 | |
| **202** | 3.6 | | | 175 | | 0.19 | 9.2 | |
| **203** | 3.7 | | | 158 | | 0.23 | 9.5 | |
| **204** | 5 | | | 102 | | 0.22 | 9.1 | |
| **206** | 4.3 | | | 96 | | 0.23 | 8.3 | |
| **207** | 4.7 | | | 89 | | 0.2 | 9.9 | |
| **208** | 3.9 | | | 107 | | 0.18 | 9.8 | |
| **210** | 4.3 | | | 95 | | 0.22 | 9.7 | |
| **212** | 4.3 | | | 103 | | 0.26 | 9.3 | |
| **213** | 4.4 | | | 191 | | 0.26 | 9.5 | |
| **214** | 4.8 | | | 188 | | 0.27 | 9.4 | |
| **215** | 4.6 | | | 103 | | 0.25 | 10.3 | |
| **216** | 4.5 | | | 139 | | 0.26 | 9.9 | |
| **217** | 4.2 | | | 96 | | 0.19 | 8.9 | |
| **218** | 4.4 | | | 132 | | 0.26 | 9.9 | |
| **219** | 4.2 | | | 205 | | 0.29 | 16.4 | |
| **220** | 3.6 | | | 127 | | 0.26 | 16 | |
| **221** | 3 | <.1 | 0.3 | 101 | 0.04 | 0.16 | 15.6 | 10.6 |
| **222** | 3.2 | | | 63 | | 0.18 | 49.6 | |
| **223** | 3.7 | <.1 | 0.31 | 92 | 0.04 | 0.21 | 10.1 | 9.3 |
| **224** | 3.8 | | | 121 | | 0.25 | 15 | |
| **225** | 3.4 | <.1 | 0.24 | 99 | 0.04 | 0.19 | 12 | 10.2 |
| **226** | 4.6 | | | 100 | | 0.2 | 14.5 | |
| **228** | 3.5 | <.1 | 0.22 | 134 | 0.05 | 0.2 | 13.4 | 8.4 |
| **229** | 4 | | | 119 | | 0.24 | 14.8 | |
| **230** | 5.4 | 0.1 | 0.02 | 214 | 0.04 | 0.21 | 177.8 | 17.1 |
| **232** | 2.6 | | | 129 | | 0.12 | 7.9 | |
| **233** | 2.8 | 0.1 | 0.16 | 196 | 0.03 | 0.18 | 12.6 | 5.1 |
| **234** | 3 | | | 111 | | 0.17 | 7.8 | |
| **236** | 2.6 | <.1 | 0.11 | 111 | 0.03 | 0.18 | 8.8 | 5 |
| **237** | 2.5 | | | 109 | | 0.13 | 7.5 | |
| **238** | 4.4 | <.1 | 0.28 | 111 | 0.04 | 0.2 | 11.5 | 7.1 |
| **239** | 2.9 | | | 163 | | 0.2 | 7.8 | |
| **240** | 3.4 | <.1 | 0.15 | 110 | 0.04 | 0.2 | 9.3 | 5.9 |
| **241** | 3 | | | 91 | | 0.19 | 8.5 | |
| **242** | 3.4 | <.1 | 0.19 | 134 | 0.03 | 0.26 | 8.9 | 9.6 |
| **243** | 4.1 | | | 107 | | 0.26 | 10.1 | |
| **244** | 3.5 | | | 359 | | 0.2 | 9.4 | |
| **245** | 3.6 | | | 401 | | 0.26 | 10.3 | |
| **246** | 4.1 | <.1 | 0.2 | 149 | 0.05 | 0.26 | 13.4 | 14.4 |
| **247** | 4.4 | | | 187 | | 0.21 | 21.4 | |
| **249** | 5.3 | <.1 | 0.43 | 187 | 0.05 | 0.25 | 38.3 | 18.3 |
| **250** | 5.7 | | | 76 | | 0.32 | 21.4 | |
| **251** | 4.2 | <.1 | 0.22 | 71 | 0.05 | 0.24 | 23 | 20.7 |

| **Element** | **Mg** | **Mn** | **Mo** | **Na** | **Nb** | **Ni** | **P** | **Pb** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **1** | **0.01** | **0.001** | **0.02** | **0.1** | **0.001** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** |
| **201** | 0.36 | 97 | 53.59 | 0.28 | | 132.6 | 0.06 | 11.66 |
| **202** | 0.39 | 142 | 56.63 | 0.26 | | 115.9 | 0.07 | 12.26 |
| **203** | 0.51 | 95 | 32.31 | 0.287 | | 69.9 | 0.066 | 12.79 |
| **204** | 0.34 | 178 | 21.77 | 0.309 | | 47.1 | 0.058 | 15.32 |
| **206** | 0.33 | 67 | 17.16 | 0.302 | | 74.1 | 0.05 | 13.56 |
| **207** | 0.3 | 138 | 10.36 | 0.328 | | 41 | 0.077 | 14.5 |
| **208** | 0.52 | 151 | 24.04 | 0.254 | | 81.3 | 0.056 | 13.32 |
| **210** | 0.3 | 90 | 11.68 | 0.282 | | 64.4 | 0.063 | 15.04 |
| **212** | 0.35 | 83 | 12.53 | 0.286 | | 115.8 | 0.061 | 15.66 |
| **213** | 0.33 | 94 | 11.69 | 0.284 | | 83.6 | 0.063 | 16.6 |
| **214** | 0.31 | 77 | 5.01 | 0.271 | | 54.6 | 0.061 | 16.66 |
| **215** | 0.3 | 74 | 4.41 | 0.285 | | 49.6 | 0.058 | 17.16 |
| **216** | 0.31 | 75 | 4.88 | 0.267 | | 49.7 | 0.056 | 16.46 |
| **217** | 0.31 | 130 | 12.46 | 0.25 | | 58.4 | 0.06 | 12.61 |
| **218** | 0.31 | 85 | 9.62 | 0.284 | | 47.5 | 0.06 | 13.94 |
| **219** | 0.36 | 98 | 7.22 | 0.572 | | 35 | 0.068 | 25.19 |
| **220** | 0.34 | 86 | 6.04 | 0.6 | | 35 | 0.072 | 19.63 |
| **221** | 0.29 | 137 | 8.87 | 0.549 | 0.13 | 30.2 | 0.09 | 15.95 |
| **222** | 0.44 | 287 | 9.62 | 0.509 | | 20.4 | 0.325 | 9.73 |
| **223** | 0.34 | 145 | 9.54 | 0.791 | 0.14 | 26.3 | 0.064 | 18.38 |
| **224** | 0.37 | 104 | 12.38 | 0.623 | | 40.4 | 0.073 | 18.19 |
| **225** | 0.3 | 92 | 10.54 | 0.584 | 0.14 | 38.3 | 0.066 | 17.96 |
| **226** | 0.37 | 139 | 15.44 | 0.751 | | 38.4 | 0.063 | 17.83 |
| **228** | 0.3 | 93 | 15.89 | 0.526 | 0.21 | 40.5 | 0.078 | 17.73 |
| **229** | 0.4 | 100 | 14.73 | 0.568 | | 40.4 | 0.077 | 17.7 |
| **230** | 0.92 | 206 | 11.24 | 0.703 | 0.38 | 21.3 | 1.335 | 11.18 |
| **232** | 0.39 | 917 | 28.96 | 0.311 | | 52.8 | 0.071 | 7.83 |
| **233** | 0.41 | 148 | 30.06 | 0.375 | 0.18 | 67.3 | 0.12 | 10.75 |
| **234** | 0.38 | 209 | 35.77 | 0.355 | | 71.4 | 0.057 | 10.38 |
| **236** | 0.33 | 157 | 34 | 0.326 | 0.14 | 73.2 | 0.078 | 11.09 |
| **237** | 0.37 | 352 | 32.82 | 0.323 | | 39.3 | 0.067 | 7.5 |
| **238** | 0.36 | 172 | 40.98 | 0.465 | 0.26 | 90.3 | 0.071 | 14.77 |
| **239** | 0.42 | 314 | 23.49 | 0.346 | | 55 | 0.057 | 11.47 |
| **240** | 0.42 | 225 | 17.18 | 0.395 | 0.18 | 64.8 | 0.071 | 16.07 |
| **241** | 0.45 | 242 | 33.14 | 0.303 | | 68.3 | 0.061 | 12.44 |
| **242** | 0.34 | 122 | 5.74 | 0.391 | 0.4 | 53.3 | 0.069 | 13.88 |
| **243** | 0.36 | 174 | 6.02 | 0.431 | | 59.5 | 0.068 | 13.91 |
| **244** | 0.31 | 220 | 11.42 | 0.329 | | 61.4 | 0.063 | 12.74 |
| **245** | 0.35 | 160 | 8.92 | 0.309 | | 65.1 | 0.08 | 13.42 |
| **246** | 0.33 | 162 | 2.25 | 0.405 | 0.12 | 61.4 | 0.068 | 15.63 |
| **247** | 0.21 | 469 | 48.76 | 0.409 | | 110.7 | 0.082 | 17.51 |
| **249** | 0.26 | 178 | 34.77 | 0.494 | 0.46 | 89.8 | 0.178 | 25.29 |
| **250** | 0.36 | 594 | 0.88 | 0.698 | | 33 | 0.043 | 20.47 |
| **251** | 0.27 | 583 | 2.78 | 0.672 | 0.04 | 33.5 | 0.055 | 20.04 |

| **Element** | **Pd** | **Pt** | **Rb** | **Re** | **S** | **Sb** | **Sc** | **Se** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **10** | **2** | **0.1** | **1** | **0.02** | **0.02** | **0.1** | **0.1** |
| **Samples** | **ppb** | **ppb** | **ppm** | **ppb** | **%** | **ppm** | **ppm** | **ppm** |
| **201** | | | | | 3.47 | 3.21 | 3.6 | 9.1 |
| **202** | | | | | 3.69 | 3.37 | 3.7 | 8.5 |
| **203** | | | | | 2.8 | 2.13 | 3.9 | 5.9 |
| **204** | | | | | 3.9 | 2.64 | 3.9 | 6 |
| **206** | | | | | 3.33 | 2.03 | 3.3 | 4.7 |
| **207** | | | | | 4.38 | 1.88 | 4 | 4.4 |
| **208** | | | | | 3.86 | 2.26 | 3.7 | 7.8 |
| **210** | | | | | 3.74 | 1.57 | 3.2 | 6.6 |
| **212** | | | | | 3.1 | 0.78 | 5.1 | 7.4 |
| **213** | | | | | 3.18 | 1.26 | 4.9 | 7.7 |
| **214** | | | | | 2.94 | 0.82 | 4.7 | 4.2 |
| **215** | | | | | 2.87 | 0.8 | 4.6 | 4.3 |
| **216** | | | | | 2.94 | 0.84 | 4.4 | 4.5 |
| **217** | | | | | 3.41 | 1.91 | 3.8 | 6.4 |
| **218** | | | | | 3.76 | 1.81 | 3.3 | 4.2 |
| **219** | | | | | 2.44 | 0.28 | 3.5 | 2.8 |
| **220** | | | | | 1.99 | 0.24 | 3.4 | 2.4 |
| **221** | < 10 | < 2 | 12.5 | 41 | 2.53 | 0.28 | 2.7 | 2.9 |
| **222** | | | | | 2.34 | 0.24 | 6.2 | 2.5 |
| **223** | < 10 | 2 | 11.6 | 34 | 2.22 | 0.37 | 2.5 | 2.8 |
| **224** | | | | | 2.89 | 0.29 | 3.4 | 3.8 |
| **225** | < 10 | < 2 | 13.7 | 52 | 2.25 | 0.37 | 2.4 | 3.4 |
| **226** | | | | | 3.28 | 0.27 | 3.4 | 3.8 |
| **228** | < 10 | < 2 | 13.2 | 53 | 2.8 | 0.45 | 2.8 | 4.3 |
| **229** | | | | | 3.24 | 0.4 | 3.2 | 4.1 |
| **230** | < 10 | < 2 | 10.5 | 37 | 1.64 | 0.71 | 10.8 | 3.1 |
| **232** | | | | | 1.64 | 1.2 | 2.4 | 3.9 |
| **233** | < 10 | < 2 | 11.4 | 54 | 2.24 | 1.85 | 3.9 | 6 |
| **234** | | | | | 2.58 | 1.73 | 3.1 | 5.8 |
| **236** | 11 | < 2 | 12.1 | 56 | 2.45 | 1.96 | 3.2 | 7 |
| **237** | | | | | 2.49 | 1.33 | 2.5 | 4.5 |
| **238** | < 10 | < 2 | 12 | 72 | 2.39 | 1.97 | 3.4 | 7.6 |
| **239** | | | | | 2.95 | 1.92 | 2.9 | 4.7 |
| **240** | < 10 | 2 | 13.4 | 50 | 3.43 | 2.05 | 3.5 | 6.6 |
| **241** | | | | | 2.95 | 2.13 | 3.1 | 6.1 |
| **242** | < 10 | 2 | 17.2 | 39 | 2.59 | 1.19 | 2.5 | 4.4 |
| **243** | | | | | 3.24 | 0.76 | 5 | 6.5 |
| **244** | | | | | 4.14 | 0.97 | 3.5 | 6.5 |
| **245** | | | | | 3.59 | 0.85 | 4.1 | 6.2 |
| **246** | < 10 | 2 | 18.1 | 36 | 1.97 | 0.64 | 4.6 | 4.3 |
| **247** | | | | | 3.73 | 1.25 | 4.1 | 8 |
| **249** | < 10 | < 2 | 17.9 | 105 | 3.38 | 1.58 | 4.5 | 8.2 |
| **250** | | | | | 2.35 | 0.15 | 4.2 | 0.6 |
| **251** | < 10 | < 2 | 20.6 | 7 | 2.03 | 0.26 | 3.8 | 1.2 |

| **Element** | **Sn** | **Sr** | **Ta** | **Te** | **Th** | **Ti** | **Tl** | **U** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.5** | **0.05** | **0.02** | **0.1** | **0.001** | **0.02** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **201** | | 199.9 | | 0.15 | 3.3 | < .001 | 2.68 | 10.26 |
| **202** | | 221.8 | | 0.15 | 3.8 | < .001 | 2.22 | 14.75 |
| **203** | | 174.3 | | 0.14 | 4.5 | < .001 | 1.16 | 7.73 |
| **204** | | 117.1 | | 0.2 | 5.2 | < .001 | 0.72 | 5.91 |
| **206** | | 107 | | 0.23 | 4.7 | < .001 | 1.05 | 4.67 |
| **207** | | 106.2 | | 0.14 | 4.7 | < .001 | 0.41 | 5.45 |
| **208** | | 139.9 | | 0.28 | 3.8 | 0.007 | 1.26 | 7.79 |
| **210** | | 108.1 | | 0.21 | 4.4 | < .001 | 0.88 | 5.73 |
| **212** | | 104.4 | | 0.11 | 4.9 | < .001 | 1.14 | 3.45 |
| **213** | | 97.3 | | 0.21 | 5.2 | < .001 | 0.94 | 3.98 |
| **214** | | 108.9 | | 0.16 | 5.2 | 0.002 | 0.53 | 2.37 |
| **215** | | 102.2 | | 0.22 | 5.9 | < .001 | 0.51 | 2.23 |
| **216** | | 101.6 | | 0.2 | 5.4 | < .001 | 0.51 | 2.02 |
| **217** | | 147.3 | | 0.3 | 4.2 | < .001 | 0.62 | 6.44 |
| **218** | | 109.3 | | 0.18 | 4.9 | < .001 | 0.48 | 4.99 |
| **219** | | 117.2 | | 0.18 | 8.3 | < .001 | 0.32 | 4.27 |
| **220** | | 118.8 | | 0.14 | 7.3 | 0.005 | 0.28 | 3.65 |
| **221** | 0.7 | 211.4 | < .05 | 0.17 | 5.4 | 0.003 | 0.37 | 4.11 |
| **222** | | 585.3 | | 0.1 | 3.6 | < .001 | 0.27 | 7.97 |
| **223** | 0.8 | 129.4 | < .05 | 0.11 | 8.7 | 0.001 | 0.4 | 2.66 |
| **224** | | 127.8 | | 0.13 | 6.3 | 0.006 | 0.44 | 4.78 |
| **225** | 0.7 | 119.9 | < .05 | 0.16 | 5.8 | 0.006 | 0.44 | 3.74 |
| **226** | | 134.1 | | 0.11 | 6.6 | 0.004 | 0.51 | 5.24 |
| **228** | 0.7 | 122.1 | < .05 | 0.17 | 6.1 | 0.006 | 0.46 | 5.19 |
| **229** | | 117.1 | | 0.14 | 6.8 | < .001 | 0.53 | 5.81 |
| **230** | 0.9 | 332.9 | < .05 | 0.1 | 19.1 | 0.004 | 0.47 | 31.15 |
| **232** | | 327.3 | | 0.08 | 2.7 | 0.002 | 1.32 | 8.42 |
| **233** | 0.4 | 227.9 | < .05 | 0.11 | 3.9 | 0.001 | 1.75 | 9.36 |
| **234** | | 279.2 | | 0.1 | 3.5 | < .001 | 1.39 | 9.11 |
| **236** | 0.4 | 234.8 | < .05 | 0.11 | 3.5 | < .001 | 1.78 | 7.18 |
| **237** | | 430.4 | | 0.09 | 2.4 | < .001 | 0.65 | 7.94 |
| **238** | 0.9 | 179.8 | < .05 | 0.09 | 5.4 | 0.007 | 2.02 | 7.99 |
| **239** | | 181.6 | | 0.14 | 3.4 | < .001 | 1.18 | 5.72 |
| **240** | 0.6 | 181.3 | < .05 | 0.21 | 4.5 | 0.004 | 1.45 | 6.86 |
| **241** | | 166.2 | | 0.18 | 3.7 | 0.004 | 1.52 | 6.97 |
| **242** | 0.7 | 144 | < .05 | 0.24 | 4.6 | < .001 | 0.88 | 2.63 |
| **243** | | 138.4 | | 0.4 | 5.3 | 0.004 | 0.79 | 3.13 |
| **244** | | 163.5 | | 0.36 | 3.9 | 0.003 | 1.03 | 4.28 |
| **245** | | 146.8 | | 0.33 | 4.3 | < .001 | 1.02 | 3.57 |
| **246** | 0.9 | 105.2 | < .05 | 0.22 | 5.1 | < .001 | 0.36 | 2.61 |
| **247** | | 142.7 | | 0.2 | 6.5 | 0.003 | 2.71 | 16.94 |
| **249** | 1.4 | 122.8 | < .05 | 0.21 | 10.4 | 0.006 | 3.34 | 17.19 |
| **250** | | 106.4 | | 0.09 | 10.9 | 0.002 | 0.13 | 1.78 |
| **251** | 1.2 | 117.2 | < .05 | 0.11 | 10.5 | < .001 | 0.31 | 2.99 |

***Analysis: GROUP 1EX - 0.25 GM***

| **Element** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ag** | **Al** | **As** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.1** | **0.01** | **0.1** | **0.1** | **0.1** | **0.01** | **1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** |
| **201** | 266 | < .1 | | 249.4 | | | | |
| **202** | 179 | < .1 | | 225.7 | | | | |
| **203** | 121 | < .1 | | 156.8 | | | | |
| **204** | 79 | < .1 | | 180 | | | | |
| **206** | 83 | < .1 | | 162.5 | | | | |
| **207** | 55 | < .1 | | 136.9 | | | | |
| **208** | 116 | < .1 | | 221.7 | | | | |
| **210** | 84 | < .1 | | 195.4 | | | | |
| **212** | 67 | < .1 | | 160.8 | | | | |
| **213** | 63 | < .1 | | 163.3 | | | | |
| **214** | 52 | < .1 | | 144.9 | | | | |
| **215** | 46 | < .1 | | 138.5 | | | | |
| **216** | 48 | < .1 | | 183.1 | | | | |
| **217** | 68 | < .1 | | 171.5 | | | | |
| **218** | 54 | < .1 | | 171.6 | | | | |
| **219** | 36 | < .1 | | 115.7 | | 0.4 | 7.05 | 18 |
| **220** | 28 | < .1 | | 115.2 | | | | |
| **221** | 22 | < .1 | 19.36 | 105.3 | 13 | 0.4 | 6.34 | 21 |
| **222** | 31 | < .1 | | 69.2 | | | | |
| **223** | 21 | < .1 | 8.5 | 101.3 | 14 | 0.4 | 7.55 | 20 |
| **224** | 40 | < .1 | | 124.4 | | | | |
| **225** | 24 | < .1 | 12.89 | 125.6 | 12.8 | 0.4 | 6.75 | 19 |
| **226** | 33 | < .1 | | 132.4 | | | | |
| **228** | 29 | < .1 | 14.88 | 136 | 15.3 | 0.4 | 6.21 | 29 |
| **229** | 42 | < .1 | | 132.4 | | | | |
| **230** | 90 | < .1 | 193.37 | 191.5 | 1.5 | 0.3 | 6.25 | 20 |
| **232** | 90 | < .1 | | 103.6 | | | | |
| **233** | 102 | < .1 | 18.5 | 160.3 | 7.5 | 0.4 | 4.48 | 20 |
| **234** | 82 | < .1 | | 155.8 | | | | |
| **236** | 95 | < .1 | 11.8 | 171.4 | 6.3 | 0.4 | 4.58 | 19 |
| **237** | 52 | < .1 | | 101.4 | | | | |
| **238** | 110 | < .1 | 10.96 | 199.4 | 13.1 | 0.5 | 5.6 | 19 |
| **239** | 87 | < .1 | | 131 | | | | |
| **240** | 75 | < .1 | 12.13 | 209.8 | 8.2 | 0.5 | 5.06 | 27 |
| **241** | 101 | < .1 | | 158.9 | | | | |
| **242** | 48 | < .1 | 8.5 | 144.9 | 8.7 | 0.4 | 6.65 | 20 |
| **243** | 74 | < .1 | | 140.4 | | | | |
| **244** | 54 | < .1 | | 175.2 | | | | |
| **245** | 61 | < .1 | | 242.6 | | | | |
| **246** | 46 | < .1 | 12.82 | 124.3 | 9 | 0.3 | 7.09 | 12 |
| **247** | 119 | < .1 | | 213.9 | | | | |
| **249** | 98 | < .1 | 38.66 | 204.9 | 19 | 0.8 | 6.99 | 23 |
| **250** | 24 | < .1 | | 88.3 | | | | |
| **251** | 18 | < .1 | 15.92 | 123.4 | 10 | 0.2 | 8.4 | 12 |

| Element | Au | Ba | Be | Bi | Ca | Cd | Ce | Co |
|---|---|---|---|---|---|---|---|---|
| LDL | 0.1 | 1 | 1 | 0.1 | 0.01 | 0.1 | 1 | 1 |
| Samples | ppm | ppm | ppm | ppm | % | ppm | ppm | ppm |
| 219 | < .1 | 69 | 2 | 0.6 | 0.5 | 0.7 | 68 | 10 |
| 221 | < .1 | 67 | 3 | 0.5 | 4.1 | 0.8 | 62 | 10 |
| 223 | < .1 | 64 | 1 | 0.5 | 1.1 | 0.6 | 42 | 9 |
| 225 | < .1 | 79 | 2 | 0.5 | 0.73 | 0.9 | 53 | 10 |
| 228 | < .1 | 53 | 3 | 0.6 | 1.63 | 1.1 | 50 | 12 |
| 230 | < .1 | 53 | 1 | 0.3 | 5.5 | 2.4 | 292 | 6 |
| 233 | < .1 | 110 | 1 | 0.3 | 9.88 | 2.3 | 50 | 13 |
| 236 | < .1 | 122 | 2 | 0.2 | 8.97 | 2.5 | 45 | 15 |
| 238 | < .1 | 178 | 2 | 0.3 | 7.01 | 2.9 | 50 | 13 |
| 240 | < .1 | 103 | 1 | 0.2 | 7.71 | 2.4 | 46 | 18 |
| 242 | < .1 | 65 | 5 | 0.3 | 3.46 | 1.4 | 51 | 15 |
| 246 | < .1 | 105 | 2 | 0.2 | 1.45 | 0.8 | 53 | 14 |
| 249 | < .1 | 62 | 3 | 0.5 | 1.03 | 2.8 | 91 | 21 |
| 251 | < .1 | 173 | 3 | 0.5 | 0.37 | 0.5 | 64 | 18 |

| Element | Cr | Cu | Fe | Hf | K | La | Li | Mg |
|---|---|---|---|---|---|---|---|---|
| LDL | 0.1 | 0.1 | 0.01 | 0.1 | 0.01 | 0.1 | 0.1 | 0.01 |
| Samples | ppm | ppm | % | ppm | % | ppm | ppm | % |
| 219 | 97.4 | 61.6 | 3.58 | 3.3 | 2.01 | 37.7 | 40.1 | 0.91 |
| 221 | 70.2 | 50.4 | 3.62 | 2.4 | 1.5 | 30.1 | 35.8 | 0.94 |
| 223 | 59.8 | 45.8 | 3.23 | 2.8 | 1.34 | 20.4 | 38.2 | 1.2 |
| 225 | 81.3 | 56 | 3.18 | 2.6 | 1.77 | 27.3 | 38.3 | 0.98 |
| 228 | 76.1 | 58.5 | 3.85 | 2.4 | 1.67 | 24.1 | 32.2 | 0.92 |
| 230 | 41.4 | 30 | 2.35 | 2.2 | 1.02 | 156.8 | 32.2 | 1.3 |
| 233 | 74.5 | 41.8 | 2.88 | 1.7 | 1.48 | 26.6 | 25 | 0.76 |
| 236 | 72.9 | 44.2 | 3.04 | 1.6 | 1.49 | 22.8 | 23.6 | 0.67 |
| 238 | 75.4 | 48.9 | 2.87 | 2.3 | 1.47 | 24.2 | 30.2 | 0.81 |
| 240 | 76.4 | 52.7 | 3.79 | 1.7 | 1.61 | 24 | 26 | 0.75 |
| 242 | 93 | 63 | 3.55 | 2.2 | 2.02 | 26.6 | 43.4 | 0.78 |
| 246 | 141.6 | 82.5 | 3.24 | 2.5 | 2.11 | 25.5 | 59.7 | 0.77 |
| 249 | 81.8 | 80.9 | 4.5 | 3 | 1.79 | 43.7 | 58.1 | 0.69 |
| 251 | 82.5 | 36.2 | 4.32 | 3.4 | 1.74 | 27.4 | 69.2 | 0.85 |

| **Element** | **Mn** | **Mo** | **Na** | **Nb** | **Ni** | **P** | **Pb** | **Rb** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **1** | **0.1** | **0.001** | **0.1** | **0.1** | **0.001** | **0.1** | **0.1** |
| **Samples** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **219** | 109 | 8.5 | 0.761 | 11.2 | 39.8 | 0.091 | 25 | 111.5 |
| **221** | 164 | 9.9 | 0.775 | 8.4 | 30.7 | 0.096 | 18.9 | 92.1 |
| **223** | 177 | 10.9 | 1.267 | 7.3 | 29.3 | 0.07 | 23.8 | 71.7 |
| **225** | 124 | 11 | 0.804 | 10.1 | 37.6 | 0.069 | 20.5 | 97 |
| **228** | 123 | 17.5 | 0.742 | 9.8 | 44.6 | 0.084 | 21.5 | 84.9 |
| **230** | 236 | 12.1 | 1.192 | 6.2 | 21.8 | 1.323 | 13.2 | 44.6 |
| **233** | 183 | 31.6 | 0.572 | 7.9 | 68.5 | 0.125 | 12.6 | 78.4 |
| **236** | 179 | 35.2 | 0.471 | 8 | 78.2 | 0.081 | 13.1 | 84.5 |
| **238** | 187 | 41.4 | 0.576 | 8.7 | 82.6 | 0.068 | 15.4 | 84.4 |
| **240** | 225 | 16.2 | 0.521 | 8.4 | 58.4 | 0.07 | 16.7 | 92.5 |
| **242** | 147 | 5.9 | 0.54 | 10.3 | 53.8 | 0.071 | 15.2 | 115.6 |
| **246** | 195 | 2.8 | 0.592 | 11.4 | 63.1 | 0.075 | 16.7 | 98.5 |
| **249** | 224 | 38.5 | 0.698 | 11.4 | 93.4 | 0.17 | 28.5 | 94.8 |
| **251** | 755 | 3.8 | 0.8 | 12.6 | 41.7 | 0.063 | 23.5 | 87.6 |

| **Element** | **S** | **Sb** | **Sc** | **Sn** | **Sr** | **Ta** | **Th** | **Ti** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **1** | **0.1** | **1** | **0.1** | **0.1** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **219** | 2.9 | 0.8 | 12 | 2.4 | 188 | 0.8 | 11.9 | 0.387 |
| **221** | 3.1 | 0.6 | 9 | 1.6 | 283 | 0.5 | 8.6 | 0.292 |
| **223** | 2.7 | 0.9 | 8 | 1.8 | 299 | 0.7 | 11 | 0.307 |
| **225** | 2.5 | 0.6 | 10 | 1.8 | 185 | 0.7 | 8.7 | 0.323 |
| **228** | 3.4 | 1 | 9 | 1.6 | 190 | 0.7 | 9.1 | 0.313 |
| **230** | 2 | 1.1 | 13 | 1 | 471 | 0.6 | 21.1 | 0.225 |
| **233** | 3 | 3.5 | 8 | 1.3 | 307 | 0.4 | 6.6 | 0.228 |
| **236** | 3.2 | 3.4 | 8 | 1.2 | 287 | 0.5 | 6.3 | 0.243 |
| **238** | 2.8 | 4.1 | 8 | 1.7 | 218 | 0.7 | 7.8 | 0.249 |
| **240** | 3.8 | 3.8 | 9 | 1.4 | 224 | 0.5 | 7.1 | 0.26 |
| **242** | 2.9 | 2.5 | 10 | 1.9 | 207 | 0.6 | 7.9 | 0.321 |
| **246** | 2.3 | 1.2 | 12 | 2 | 162 | 0.7 | 7.1 | 0.394 |
| **249** | 3.9 | 3 | 11 | 2.7 | 178 | 0.7 | 12.9 | 0.319 |
| **251** | 2.2 | 0.6 | 11 | 2.6 | 157 | 0.8 | 11.5 | 0.44 |

***Analysis: GROUP 4B - REE - 0.200 GM***

| **Element** | **U** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ce** | **Co** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **1** | **0.1** | **0.1** | **1** | **0.1** | **0.5** | **0.5** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **219** | 5.9 | 213 | 1.5 | 25.5 | 137 | 89.9 | 78.7 | 9.6 |
| **221** | 5.8 | 172 | 1.3 | 24.8 | 119 | 71.1 | 63.6 | 9.2 |
| **223** | 4.3 | 155 | 1 | 12.7 | 117 | 75.1 | 50.7 | 9.9 |
| **225** | 5.5 | 204 | 1.1 | 17.7 | 136 | 76.9 | 60.8 | 10.3 |
| **228** | 6.3 | 211 | 1.1 | 19.4 | 147 | 82.7 | 64.2 | 11.1 |
| **230** | 32.2 | 175 | 0.7 | 186 | 198 | 69.9 | 322.4 | 7.4 |
| **233** | 10.6 | 356 | 0.6 | 23.4 | 182 | 50.6 | 52.3 | 9.3 |
| **236** | 8.3 | 381 | 1.1 | 17.3 | 188 | 48.8 | 49.5 | 11.9 |
| **238** | 8.9 | 368 | 0.9 | 14.8 | 206 | 66.7 | 56.9 | 11.1 |
| **240** | 7.6 | 278 | 1 | 15.1 | 227 | 55.5 | 52.3 | 13.1 |
| **242** | 4.3 | 235 | 1.2 | 13.2 | 167 | 65.6 | 59.7 | 15.3 |
| **246** | 4.2 | 272 | 1.3 | 15.4 | 133 | 71.6 | 76.7 | 14.1 |
| **249** | 17.6 | 324 | 1.2 | 43.3 | 221 | 83.8 | 96.7 | 18.4 |
| **251** | 4.5 | 145 | 1.5 | 19.5 | 138 | 95 | 88.1 | 17.1 |

| **Element** | **Cs** | **Dy** | **Er** | **Eu** | **Ga** | **Gd** | **Hf** | **Ho** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.05** | **0.05** | **0.05** | **0.5** | **0.05** | **0.5** | **0.05** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **219** | 8.1 | 5.04 | 2.77 | 1.33 | 18.2 | 5.46 | 4.3 | 0.97 |
| **221** | 5.8 | 4.65 | 2.62 | 1.21 | 14.9 | 5.23 | 3.5 | 0.98 |
| **223** | 5.4 | 2.77 | 1.61 | 0.84 | 17.7 | 3.25 | 3.8 | 0.59 |
| **225** | 7 | 3.62 | 2.1 | 1.08 | 16.5 | 4.27 | 3.6 | 0.77 |
| **228** | 6.5 | 4.13 | 2.38 | 1.11 | 16.2 | 4.96 | 3.8 | 0.87 |
| **230** | 2.5 | 33.17 | 16.5 | 8.91 | 13.8 | 42 | 4.9 | 6.55 |
| **233** | 4.6 | 4.26 | 2.33 | 1.16 | 11.1 | 5.13 | 2.3 | 0.87 |
| **236** | 5.4 | 3.41 | 1.77 | 0.93 | 12.4 | 3.71 | 2.3 | 0.7 |
| **238** | 5.7 | 3.24 | 1.72 | 0.83 | 15.3 | 4 | 3.4 | 0.63 |
| **240** | 6.3 | 3.23 | 1.68 | 0.98 | 13.7 | 3.58 | 2.9 | 0.66 |
| **242** | 8.4 | 3.26 | 1.76 | 1.03 | 17.1 | 3.39 | 2.8 | 0.6 |
| **246** | 9 | 4.32 | 2.6 | 1.29 | 21.3 | 5.07 | 3.5 | 0.9 |
| **249** | 6.3 | 7.83 | 4.3 | 1.83 | 17.8 | 8.56 | 4 | 1.68 |
| **251** | 6.9 | 5.25 | 2.94 | 1.56 | 21.3 | 6.02 | 5.1 | 1.04 |

| **Element** | **La** | **Lu** | **Nb** | **Nd** | **Pr** | **Sn** | **Rb** | **Sm** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.5** | **0.01** | **0.5** | **0.4** | **0.02** | **1** | **0.5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **219** | 40.1 | 0.39 | 14.7 | 32.4 | 9.3 | < 1 | 116.6 | 6.8 |
| **221** | 33 | 0.37 | 11.5 | 30.3 | 7.49 | < 1 | 91.5 | 5.2 |
| **223** | 27.3 | 0.26 | 10.4 | 22.2 | 5.61 | 1 | 81.2 | 3.9 |
| **225** | 31.9 | 0.33 | 12.1 | 27.3 | 6.96 | 1 | 107 | 4.8 |
| **228** | 34.9 | 0.36 | 13.1 | 29 | 7.4 | < 1 | 103.2 | 5.1 |
| **230** | 170.3 | 1.84 | 8.8 | 181.9 | 41.69 | < 1 | 47.4 | 39.7 |
| **233** | 26.4 | 0.29 | 9.4 | 24.9 | 6.29 | < 1 | 74.7 | 4.6 |
| **236** | 25 | 0.29 | 10.3 | 21.6 | 5.79 | < 1 | 87.2 | 3.9 |
| **238** | 28.2 | 0.28 | 12.2 | 25.6 | 6.65 | < 1 | 87.1 | 4.6 |
| **242** | 31 | 0.29 | 15.3 | 27.3 | 7.09 | < 1 | 123.3 | 4.4 |
| **246** | 40.2 | 0.38 | 16.8 | 34.5 | 9.01 | 1 | 138.4 | 6.4 |
| **249** | 49.9 | 0.58 | 15.2 | 46.6 | 11.81 | < 1 | 99 | 9.1 |
| **251** | 40.1 | 0.43 | 17.2 | 36.4 | 10.11 | 2 | 111.3 | 6.9 |

| **Element** | **Sr** | **Ta** | **Tb** | **Th** | **Tm** | **U** | **V** | **W** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.5** | **0.1** | **0.01** | **0.1** | **0.05** | **0.1** | **5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **219** | 215.8 | 1.1 | 0.89 | 14.2 | 0.43 | 6.3 | 199 | 1.8 |
| **221** | 298.5 | 0.8 | 0.85 | 9 | 0.42 | 6.4 | 175 | 1.3 |
| **223** | 322.8 | 0.9 | 0.47 | 12.1 | 0.24 | 4.8 | 155 | 1.2 |
| **225** | 196.4 | 0.8 | 0.7 | 10.1 | 0.37 | 6.4 | 206 | 1.5 |
| **228** | 212.8 | 0.9 | 0.79 | 10 | 0.39 | 8 | 211 | 1.7 |
| **230** | 514.7 | 0.6 | 6.74 | 25.8 | 2.32 | 36.1 | 178 | 1.1 |
| **233** | 285.4 | 0.5 | 0.76 | 7.3 | 0.37 | 12 | 343 | 0.8 |
| **236** | 305 | 0.6 | 0.58 | 8.8 | 0.29 | 9.8 | 394 | 1.3 |
| **238** | 240.5 | 0.8 | 0.6 | 7.6 | 0.28 | 10.5 | 377 | 1.3 |
| **240** | 230.7 | 0.7 | 0.61 | 8.3 | 0.32 | 8.8 | 274 | 1.4 |
| **242** | 221.1 | 0.7 | 0.62 | 10.2 | 0.3 | 4.9 | 244 | 1.4 |
| **246** | 195.2 | 0.9 | 0.81 | 11.7 | 0.4 | 5.5 | 277 | 1.4 |
| **249** | 182.3 | 1 | 1.44 | 15.5 | 0.7 | 19.1 | 310 | 1.3 |
| **251** | 171.8 | 1.1 | 1.08 | 14.7 | 0.5 | 4.9 | 132 | 2.3 |

***Analysis: GROUP 4A - 0.200 GM***

| **Element** | **Y** | **Yb** | **Zr** | **Al2O3** | **Ba** | **CaO** | **Cr2O3** | **Cr2O3** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.05** | **0.5** | **0.03** | **5** | **0.01** | **0.001** | **0.001** |
| **Samples** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **%** | **%** | **%** |
| **219** | 33 | 2.72 | 134.5 | 13.73 | 754.5 | 0.73 | 0.012 | |
| **221** | 32 | 2.92 | 109.9 | 12.82 | 641 | 6.23 | 0.012 | 0.0097 |
| **223** | 18.4 | 1.72 | 124.2 | 15.5 | 638 | 1.72 | 0.008 | 0.0078 |
| **225** | 24.7 | 2.5 | 117.8 | 13.87 | 694 | 1.15 | 0.01 | 0.0112 |
| **228** | 27.6 | 2.49 | 132.1 | 12.99 | 660 | 2.47 | 0.01 | 0.0105 |
| **230** | 233.5 | 13.3 | 164.6 | 12.7 | 2219 | 8.73 | 0.006 | 0.0056 |
| **233** | 28.2 | 2.12 | 83.7 | 9.36 | 528 | 16.34 | 0.008 | 0.0088 |
| **236** | 21.2 | 1.73 | 79.5 | 9.96 | 566 | 15.32 | 0.009 | 0.01 |
| **238** | 19.6 | 1.93 | 96.1 | 11.62 | 541 | 11.45 | 0.009 | 0.0092 |
| **240** | 20.6 | 2.11 | 93.4 | 10.94 | 555 | 13.27 | 0.011 | 0.0097 |
| **242** | 19.4 | 2 | 97.3 | 13.45 | 640 | 5.48 | 0.011 | 0.0131 |
| **246** | 26.9 | 2.53 | 117.2 | 15.49 | 718 | 2.32 | 0.02 | 0.0209 |
| **249** | 52.4 | 4.27 | 153 | 13.78 | 584 | 1.53 | 0.008 | 0.0105 |
| **251** | 30.1 | 3.06 | 165.4 | 17.22 | 452 | 0.58 | 0.01 | 0.0111 |

| **Element** | **Fe2O3** | **K2O** | **LOI** | **MgO** | **MnO** | **Na2O** | **Ni** | **P2O5** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.04** | **0.04** | **0.1** | **0.01** | **0.01** | **0.01** | **30** | **0.01** |
| **Samples** | **%** | **%** | **%** | **%** | **%** | **%** | **ppm** | **%** |
| **219** | 4.81 | 2.45 | 17.5 | 1.66 | 0.01 | 1.15 | 31 | 0.2 |
| **221** | 5.25 | 2.03 | 17.2 | 1.69 | 0.02 | 1.13 | 34 | 0.24 |
| **223** | 4.57 | 1.74 | 17 | 2.16 | 0.02 | 1.73 | 37 | 0.18 |
| **225** | 4.5 | 2.34 | 16.9 | 1.8 | 0.02 | 1.14 | 35 | 0.18 |
| **228** | 5.28 | 2.18 | 18.3 | 1.65 | 0.01 | 1.05 | 23 | 0.2 |
| **230** | 3.41 | 1.33 | 13.3 | 2.3 | 0.03 | 1.69 | 33 | 3.36 |
| **233** | 3.57 | 1.87 | 21.1 | 1.42 | 0.02 | 0.78 | 34 | 0.32 |
| **236** | 4.28 | 2.05 | 20.2 | 1.32 | 0.02 | 0.71 | 39 | 0.19 |
| **238** | 3.46 | 2 | 22.3 | 1.56 | 0.02 | 0.89 | 56 | 0.18 |
| **240** | 4.65 | 2.3 | 20.2 | 1.5 | 0.03 | 0.75 | 32 | 0.17 |
| **242** | 4.99 | 2.66 | 18.7 | 1.46 | 0.02 | 0.8 | 40 | 0.17 |
| **246** | 4.63 | 2.87 | 15.4 | 1.5 | 0.02 | 0.83 | 50 | 0.2 |
| **249** | 6.41 | 2.27 | 21.3 | 1.26 | 0.03 | 0.96 | 63 | 0.42 |
| **251** | 6.33 | 2.23 | 13.3 | 1.54 | 0.09 | 1.17 | 43 | 0.16 |

|  |  |  |  |  |  |  | ***Analysis: CO2*** |  |
|---|---|---|---|---|---|---|---|---|
| **Element** | **Sc** | **SiO2** | **TiO2** | **TOT/C** | **TOT/S** | **SUM** | **C/ORG** | **C/GRA** |
| **LDL** | **1** | **0.02** | **0.01** | **0.01** | **0.01** |  |  |  |
| **Samples** | **ppm** | **%** | **%** | **%** | **%** | **%** | **%** | **%** |
| **219** | 13 | 56.66 | 0.64 | 5.56 | 3.35 | 99.56 | 5.51 | 0.03 |
| **221** | 10 | 52.53 | 0.55 | 6.03 | 3.58 | 99.77 | 5.04 | 0.03 |
| **223** | 9 | 54.56 | 0.53 | 3.95 | 2.97 | 99.79 | 3.85 | 0.02 |
| **225** | 11 | 57.21 | 0.59 | 5.4 | 3.03 | 99.8 | 5.3 | 0.03 |
| **228** | 10 | 55.02 | 0.57 | 6.13 | 3.93 | 99.81 | 5.95 | 0.02 |
| **230** | 14 | 52.22 | 0.39 | 3.13 | 2.29 | 99.71 | 2.31 | 0.03 |
| **233** | 8 | 44.49 | 0.42 | 8.94 | 3.07 | 99.76 | 6.06 | 0.03 |
| **236** | 9 | 45.14 | 0.44 | 8.91 | 3.38 | 99.71 | 6.28 | 0.03 |
| **238** | 9 | 45.74 | 0.45 | 9.36 | 3.22 | 99.74 | 9.32 | 0.02 |
| **240** | 9 | 45.42 | 0.49 | 8.5 | 4.01 | 99.81 | 8.33 | 0.03 |
| **242** | 10 | 51.39 | 0.57 | 6.43 | 3.44 | 99.78 | 6.34 | 0.05 |
| **246** | 16 | 55.74 | 0.7 | 4.83 | 2.67 | 99.81 | 4.76 | 0.04 |
| **249** | 12 | 51.1 | 0.58 | 7.68 | 4.44 | 99.72 | 7.6 | 0.03 |
| **251** | 14 | 56.35 | 0.77 | 1.93 | 2.67 | 99.81 | 1.89 | < .02 |

| **Element** | **CO2** | **SO4** |
|---|---|---|
| **LDL** |  |  |
| **Samples** | **%** | **%** |
| **219** | 0.09 | 1.7 |
| **221** | 3.51 | 4.02 |
| **223** | 0.31 | 2.27 |
| **225** | 0.24 | 1.98 |
| **228** | 0.6 | 3.35 |
| **230** | 2.9 | 2.65 |
| **233** | 10.43 | 6.14 |
| **236** | 9.56 | 5.88 |
| **238** | 0.11 | 5.15 |
| **240** | 0.52 | 8.58 |
| **242** | 0.15 | 5.24 |
| **246** | 0.15 | 2.65 |
| **249** | 0.21 | 1.78 |
| **251** | 0.1 | 0.87 |

| **Samples** | **Hole** | **Latitude** | **Longitude** | **From (m)** | **To (m)** | **Analysis Date** |
|---|---|---|---|---|---|---|
| **252** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 444.470 | 444.540 | Dec. 2003 |
| **253** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 445.380 | 445.440 | Dec. 2003 |
| **254** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 445.140 | 445.140 | Dec. 2003 |
| **255** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 446.390 | 446.450 | Dec. 2003 |
| **257** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 447.400 | 447.450 | Dec. 2003 |
| **258** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 448.360 | 448.420 | Dec. 2003 |
| **259** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 449.200 | 449.240 | Dec. 2003 |
| **260** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 449.410 | 449.480 | Dec. 2003 |
| **261** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 450.380 | 450.450 | Dec. 2003 |
| **262** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 450.990 | 451.030 | Dec. 2003 |
| **263** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 451.390 | 451.450 | Dec. 2003 |
| **264** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 451.730 | 451.740 | Dec. 2003 |
| **265** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 452.440 | 452.510 | Dec. 2003 |
| **266** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 453.440 | 453.510 | Dec. 2003 |
| **267** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 453.750 | 453.765 | Dec. 2003 |
| **268** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 454.420 | 454.480 | Dec. 2003 |
| **269** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 454.200 | 454.240 | Dec. 2003 |
| **270** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 454.240 | 454.430 | Dec. 2003 |
| **271** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 454.430 | 454.490 | Dec. 2003 |
| **272** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 454.830 | 454.900 | Dec. 2003 |
| **273** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 455.810 | 455.880 | Dec. 2003 |
| **274** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 456.780 | 456.850 | Dec. 2003 |
| **275** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 457.770 | 457.840 | Dec. 2003 |
| **276** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 458.680 | 458.750 | Dec. 2003 |
| **277** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1533.430 | 1533.435 | Dec. 2003 |
| **277** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1533.430 | 1533.435 | April 2004 |
| **278** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1534.435 | 1534.440 | Dec. 2003 |
| **279** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1535.425 | 1535.430 | Dec. 2003 |
| **280** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1536.430 | 1536.435 | Dec. 2003 |
| **280** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1536.430 | 1536.435 | April 2004 |
| **281** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1537.435 | 1537.440 | Dec. 2003 |
| **282** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1541.630 | 1541.635 | Dec. 2003 |
| **284** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1542.600 | 1542.605 | Dec. 2003 |
| **285** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1543.580 | 1543.585 | Dec. 2003 |
| **286** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1544.610 | 1544.615 | Dec. 2003 |
| **287** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1545.620 | 1545.625 | Dec. 2003 |
| **288** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1546.590 | 1546.950 | Dec. 2003 |
| **289** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1547.630 | 1547.635 | Dec. 2003 |
| **290** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1555.285 | 1555.290 | Dec. 2003 |
| **291** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1555.170 | 1555.170 | Dec. 2003 |
| **292** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1556.250 | 1556.255 | Dec. 2003 |
| **294** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1557.940 | 1557.945 | Dec. 2003 |
| **295** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1558.050 | 1558.055 | Dec. 2003 |
| **296** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1559.020 | 1559.030 | Dec. 2003 |
| **297** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1560.770 | 1560.775 | Dec. 2003 |
| **298** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1561.780 | 1561.785 | Dec. 2003 |
| **299** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1562.780 | 1562.785 | Dec. 2003 |

| Samples | Probability of Fm | Formation | Sample Description |
|---|---|---|---|
| 252 | Known | Carlile (or overlying shale) | Broken fragments of shale, silty, fissile, some brown colouration in areas |
| 253 | Known | Carlile (or overlying shale) | Broken fragments of shale, silty, some specks visible |
| 254 | Known | Carlile (or overlying shale) | Over interval of 15 cm - glauconite? - thin section, burnt sections |
| 255 | Known | Carlile (or overlying shale) | Broken fragments of shale, some brown staining |
| 257 | Known | Carlile (or overlying shale) | Broken fragments of shale, minor silt, organic fragments |
| 258 | Known | Carlile (or overlying shale) | Dk grey shale, micas, pockets of silt |
| 259 | Known | Carlile (or overlying shale) | Halo + mineralization, brown discolouration in areas |
| 260 | Known | Carlile (or overlying shale) | Broken fragments of shale, silt |
| 261 | Known | Carlile (or overlying shale) | Broken fragments of shale, micas, some silt |
| 262 | Known | Carlile (or overlying shale) | Pyrite in shale |
| 263 | Known | Carlile (or overlying shale) | Dk grey shale, some silt |
| 264 | Known | Carlile (or overlying shale) | Pyrite nodule |
| 265 | Known | Carlile (or overlying shale) | Dk grey shale, micas, minor silt |
| 266 | Known | Carlile (or overlying shale) | Dk grey shale, some silty pockets |
| 267 | Known | Carlile (or overlying shale) | Heavy mineralized alteration (bentonite??) - thin section? |
| 268 | Known | Carlile (or overlying shale) | Broken fragments of shale, micas, minor silt |
| 269 | Known | Carlile (or overlying shale) | Shale above 'burnt horizon', dk grey, micas, small amount of silt |
| 270 | Known | Carlile (or overlying shale) | burnt horizon', reddish/brown |
| 271 | Known | Carlile (or overlying shale) | shale below 'burnt horizon', micas, some silt |
| 272 | Known | Carlile (or overlying shale) | Broken fragments of shale, micas, some silt, some brown colouration in spots |
| 273 | Known | Carlile (or overlying shale) | Dk grey shale, micas, silt, brown colouration in areas |
| 274 | Known | Carlile (or overlying shale) | Dk grey shale, some micas, minor silt |
| 275 | Known | Carlile (or overlying shale) | Dk grey shale, silt, micas, minor fish debris |
| 276 | Known | Carlile (or overlying shale) | Broken fragments of shale, redish brown colour in areas, mica, silty |
| 277 | Known | Second White Specks | Dk grey shale, micas, minor silt |
| 277 | Known | Second White Specks | Dk grey shale, micas, minor silt |
| 278 | Known | Second White Specks | Dk grey shale, micas, minor silt |
| 279 | Known | Second White Specks | Dk grey shale, micas |
| 280 | Known | Second White Specks | Dk grey shale, some silt, mica rich |
| 280 | Known | Second White Specks | Dk grey shale, some silt, mica rich |
| 281 | Known | Second White Specks | Dk grey shale, micas, some silt, some shelly/fish debris fragments |
| 282 | Probable | Second White Specks | Dk grey shale, micas, some silt, fish/shell debris |
| 284 | Possible | Second White Specks | Dk grey shale, some silt, some fish/shell debris |
| 285 | Possible | Second White Specks | Dk grey shale, fish debris, silt |
| 286 | Possible | Second White Specks | Dk grey shale, organic fragments, micas, minor silt |
| 287 | Possible | Second White Specks | Dk grey shale, micas, minor silt, some organic debris |
| 288 | Possible | Second White Specks | Dk grey shale, micas, minor silt |
| 289 | Possible | Base of SWS | Dk grey shale, micas |
| 290 | Possible | Top of Belle Fourche | Dk grey shale, micas |
| 291 | Possible | Top of Belle Fourche | Pyritized shell |
| 292 | Possible | Top of Belle Fourche | Dk grey shale, micas, fish debris, some silt |
| 294 | Possible | Top of Belle Fourche | Fish layer |
| 295 | Possible | Top of Belle Fourche | Dk grey shale, micas, concentrated fish debris |
| 296 | Possible | Top of Belle Fourche | Dk grey shale, some silt, some micas |
| 297 | Possible | Top of Belle Fourche | Dk grey shale, minor silt, micas |
| 298 | Possible | Top of Belle Fourche | Dk grey shale, fish debris, minor silt and micas |
| 299 | Possible | Top of Belle Fourche | Dk grey shale, some yellow/red discolouration in an area, black fragments, some micas and silt |

***Analysis: GROUP 1F1 - 1.00 GM***

| **Element** | **Ag** | **Al** | **As** | **Au** | **B** | **Ba** | **Be** | **Bi** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** | **0.1** | **0.02** |
| **Samples** | **ppb** | **%** | **ppm** | **ppb** | **ppm** | **ppm** | **ppm** | **ppm** |
| **252** | 83 | 1.4 | 6.2 | < .2 | 16 | 108.7 | | 0.58 |
| **253** | 93 | 1.27 | 10.7 | 0.2 | 16 | 144.8 | 1.3 | 0.55 |
| **254** | 82 | 1.26 | 6.5 | 0.5 | 17 | 146.8 | | 0.47 |
| **255** | 142 | 1.25 | 11.9 | 0.3 | 16 | 136.8 | | 0.56 |
| **257** | 136 | 0.97 | 19.3 | < .2 | 13 | 120.3 | 0.7 | 0.6 |
| **258** | 165 | 1.2 | 9.9 | 0.6 | 14 | 139.1 | | 0.59 |
| **259** | 164 | 1.05 | 20.6 | 0.9 | 11 | 19.5 | | 0.44 |
| **260** | 212 | 1.06 | 12.6 | 0.3 | 16 | 164.2 | 1.1 | 0.61 |
| **261** | 151 | 1.19 | 16.8 | < .2 | 14 | 133.3 | | 0.56 |
| **262** | 141 | 1.18 | 15.3 | 0.5 | 14 | 50.1 | | 0.53 |
| **263** | 138 | 1.04 | 13.1 | 0.4 | 14 | 152.3 | 0.9 | 0.64 |
| **264** | 127 | 1.26 | 8.8 | < .2 | 15 | 136.1 | | 0.57 |
| **265** | 123 | 1.1 | 13.5 | < .2 | 15 | 131.4 | | 0.59 |
| **266** | 122 | 1.08 | 13.3 | 0.3 | 13 | 164.5 | 1 | 0.6 |
| **267** | 44 | 0.17 | 204.4 | 0.2 | < 1 | 4.1 | | 0.03 |
| **268** | 135 | 1.23 | 11.2 | 0.3 | 18 | 189.9 | | 0.59 |
| **269** | 136 | 1.2 | 6.9 | 0.7 | 15 | 164.2 | | 0.55 |
| **270** | 39 | 0.6 | 7.9 | 0.5 | 8 | 151.8 | | 0.14 |
| **271** | 143 | 1.2 | 9.3 | < .2 | 16 | 156.6 | | 0.53 |
| **272** | 146 | 1.22 | 6.7 | 0.2 | 21 | 169.2 | | 0.57 |
| **273** | 139 | 1.12 | 10.6 | < .2 | 12 | 184.6 | 1.4 | 0.54 |
| **274** | 152 | 1.21 | 9.6 | < .2 | 17 | 175 | | 0.52 |
| **275** | 195 | 1.03 | 8.3 | 0.4 | 13 | 189.8 | 1.2 | 0.59 |
| **276** | 152 | 1.28 | 5.9 | 0.3 | 15 | 210.7 | | 0.68 |
| **277** | 226 | 0.86 | 34.1 | 0.3 | 8 | 37.3 | | 0.28 |
| **278** | 274 | 0.87 | 43.8 | 0.2 | 12 | 32.8 | | 0.31 |
| **279** | 249 | 0.88 | 42.9 | 0.4 | 10 | 43.7 | | 0.3 |
| **280** | 236 | 0.78 | 31.3 | < .2 | 10 | 40.2 | | 0.26 |
| **281** | 248 | 0.66 | 37.5 | 0.2 | 8 | 45.8 | | 0.24 |
| **282** | 194 | 0.53 | 29 | < .2 | 6 | 72.6 | | 0.19 |
| **284** | 266 | 0.58 | 32.6 | < .2 | 9 | 59.9 | | 0.25 |
| **285** | 217 | 0.54 | 19.9 | < .2 | 5 | 88.1 | | 0.2 |
| **286** | 315 | 0.51 | 31.4 | < .2 | 9 | 62 | | 0.23 |
| **287** | 337 | 0.67 | 38.1 | 0.4 | 11 | 47.9 | | 0.29 |
| **288** | 311 | 0.73 | 36.5 | 0.4 | 7 | 45.3 | | 0.31 |
| **289** | 311 | 0.71 | 36.6 | < .2 | 10 | 35.3 | | 0.29 |
| **290** | 599 | 0.74 | 51.8 | 0.4 | 8 | 27.7 | | 0.42 |
| **291** | 431 | 0.75 | 40.6 | < .2 | 9 | 29 | | 0.32 |
| **292** | 272 | 0.77 | 33.7 | < .2 | 8 | 40.3 | | 0.38 |
| **294** | 353 | 0.78 | 38.9 | 1 | 6 | 30.5 | | 0.38 |
| **295** | 382 | 0.8 | 34.3 | < .2 | 7 | 34.7 | | 0.44 |
| **296** | 372 | 0.88 | 28 | 0.2 | 9 | 44.7 | | 0.41 |
| **297** | 613 | 0.95 | 35.8 | 0.5 | 6 | 32.2 | | 0.54 |
| **298** | 559 | 0.94 | 40.5 | 0.2 | 8 | 31.8 | | 0.49 |
| **299** | 492 | 1.02 | 36.9 | 0.6 | 7 | 30.5 | | 0.46 |

| **Element** | **Ca** | **Cd** | **Ce** | **Co** | **Cr** | **Cs** | **Cu** | **Fe** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **0.01** | **0.1** | **0.1** | **0.5** | **0.02** | **0.01** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **252** | 0.29 | 0.14 | | 14.9 | 19.2 | | 30.6 | 2.41 |
| **253** | 0.31 | 0.24 | 53.4 | 14.8 | 16.7 | 1.16 | 32.45 | 2.23 |
| **254** | 0.3 | 0.14 | | 12.8 | 16 | | 25.96 | 2.11 |
| **255** | 0.19 | 1.24 | | 12.9 | 15.6 | | 40.65 | 2.06 |
| **257** | 0.17 | 2.19 | 52.3 | 14 | 11.2 | 1.47 | 38.63 | 2.06 |
| **258** | 0.15 | 1.81 | | 12.8 | 13.8 | | 41.9 | 2.03 |
| **259** | 0.14 | 1.67 | | 12.1 | 12 | | 34.09 | 7.3 |
| **260** | 0.17 | 2.14 | 47.4 | 13.4 | 12.3 | 1.46 | 43.5 | 1.66 |
| **261** | 0.14 | 2.37 | | 13.5 | 13.7 | | 40.75 | 2.11 |
| **262** | 0.16 | 2.39 | | 10.8 | 13.8 | | 35.48 | 3.84 |
| **263** | 0.16 | 2.11 | 54.4 | 13.5 | 11.7 | 1.53 | 39.15 | 1.71 |
| **264** | 0.15 | 1.82 | | 12.7 | 14.2 | | 40.1 | 2.31 |
| **265** | 0.15 | 2.19 | | 13.3 | 13 | | 38.32 | 2.16 |
| **266** | 0.17 | 1.93 | 53.3 | 12.6 | 12.9 | 1.55 | 36.93 | 1.73 |
| **267** | 0.02 | 0.17 | | 9.4 | 2.3 | | 4.15 | 34.71 |
| **268** | 0.16 | 2.02 | | 15.8 | 13.7 | | 43.52 | 1.6 |
| **269** | 0.25 | 1.96 | | 14.3 | 14.1 | | 40.56 | 4.34 |
| **270** | 2.58 | 0.52 | | 3.8 | 8.4 | | 11.05 | 27.35 |
| **271** | 0.17 | 1.92 | | 14.9 | 14 | | 42.92 | 1.78 |
| **272** | 0.17 | 1.82 | | 14.1 | 15.1 | | 44.95 | 1.96 |
| **273** | 0.34 | 1.7 | 50.5 | 11.3 | 12.5 | 1.51 | 41.92 | 3.26 |
| **274** | 0.24 | 1.86 | | 12.7 | 13.3 | | 49.27 | 2.32 |
| **275** | 0.23 | 2.4 | 44.8 | 12.7 | 10.8 | 1.48 | 49.88 | 1.23 |
| **276** | 0.25 | 2.14 | | 8.9 | 8.5 | | 40.73 | 1.61 |
| **277** | 2.78 | 0.59 | | 15.4 | 15.4 | | 37.53 | 4.12 |
| **278** | 2.69 | 0.8 | | 17.7 | 16.1 | | 44.88 | 3.85 |
| **279** | 4.25 | 0.78 | | 19.2 | 16.4 | | 43.54 | 3.69 |
| **280** | 3.91 | 0.92 | | 16.6 | 15.6 | | 40.22 | 4.7 |
| **281** | 6.5 | 0.94 | | 17.4 | 12.2 | | 39.84 | 3.13 |
| **282** | 8.82 | 0.65 | | 14.2 | 15 | | 31.8 | 3.65 |
| **284** | 9.3 | 1.38 | | 17 | 9.9 | | 41.65 | 2.71 |
| **285** | 9.98 | 1.22 | | 12.4 | 14.3 | | 34.07 | 2.81 |
| **286** | 10.65 | 1.59 | | 18.8 | 10.9 | | 47.29 | 3.1 |
| **287** | 7.81 | 1.68 | | 20.8 | 14 | | 51.61 | 3.7 |
| **288** | 4.98 | 1.3 | | 18.1 | 15.5 | | 51.63 | 3.29 |
| **289** | 5.19 | 1.14 | | 18.6 | 15.5 | | 48.26 | 3.67 |
| **290** | 2.63 | 3.06 | | 27.6 | 16.2 | | 72.26 | 4.56 |
| **291** | 4.1 | 1.6 | | 20.6 | 15.2 | | 54.55 | 3.67 |
| **292** | 1.91 | 1.09 | | 15.7 | 14.5 | | 44.13 | 3.63 |
| **294** | 0.72 | 1.58 | | 19 | 15.5 | | 49.32 | 3.81 |
| **295** | 2.35 | 2 | | 18.8 | 14.4 | | 49.69 | 3.7 |
| **296** | 1.44 | 1.59 | | 18.1 | 15 | | 47.35 | 2.91 |
| **297** | 0.39 | 2.91 | | 20.8 | 15.9 | | 74.63 | 3.51 |
| **298** | 0.33 | 3.01 | | 22 | 16.6 | | 67.47 | 3.92 |
| **299** | 0.73 | 2.23 | | 23 | 16.8 | | 57.4 | 3.75 |

| **Element** | **Ga** | **Ge** | **Hf** | **Hg** | **In** | **K** | **La** | **Li** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **0.02** | **5** | **0.02** | **0.01** | **0.5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppb** | **ppm** | **%** | **ppm** | **ppm** |
| **252** | 5.5 | | | 65 | | 0.33 | 23.1 | |
| **253** | 5.4 | < .1 | 0.22 | 50 | 0.06 | 0.3 | 26.6 | 20.2 |
| **254** | 5.1 | | | 39 | | 0.27 | 26.3 | |
| **255** | 5 | | | 42 | | 0.25 | 23.4 | |
| **257** | 4.2 | < .1 | 0.25 | 32 | 0.05 | 0.2 | 25.6 | 17.6 |
| **258** | 4.8 | | | 59 | | 0.23 | 25.7 | |
| **259** | 4.1 | | | 103 | | 0.2 | 19.7 | |
| **260** | 4.6 | < .1 | 0.16 | 74 | 0.06 | 0.22 | 23.2 | 19.8 |
| **261** | 4.6 | | | 87 | | 0.24 | 24.7 | |
| **262** | 4.5 | | | 90 | | 0.23 | 23.5 | |
| **263** | 4.3 | < .1 | 0.21 | 32 | 0.05 | 0.21 | 27.1 | 24.3 |
| **264** | 4.9 | | | 40 | | 0.26 | 25.3 | |
| **265** | 4.5 | | | 53 | | 0.22 | 24.4 | |
| **266** | 4.5 | < .1 | 0.18 | 80 | 0.05 | 0.24 | 26.6 | 22.3 |
| **267** | 0.5 | | | 195 | | 0.02 | 2 | |
| **268** | 4.9 | | | 72 | | 0.26 | 29.8 | |
| **269** | 4.8 | | | 61 | | 0.26 | 23.2 | |
| **270** | 2.3 | | | 8 | | 0.09 | 11.1 | |
| **271** | 4.7 | | | 43 | | 0.26 | 23 | |
| **272** | 4.8 | | | 74 | | 0.27 | 26.2 | |
| **273** | 4.3 | < .1 | 0.09 | 37 | 0.04 | 0.23 | 25.5 | 17.8 |
| **274** | 4.4 | | | 62 | | 0.26 | 22.3 | |
| **275** | 3.9 | < .1 | 0.14 | 70 | 0.05 | 0.22 | 23.4 | 17.4 |
| **276** | 4.2 | | | 89 | | 0.24 | 27.9 | |
| **277** | 2.6 | | | 125 | | 0.25 | 3.7 | |
| **278** | 2.6 | | | 170 | | 0.26 | 3.2 | |
| **279** | 2.6 | | | 120 | | 0.25 | 3.6 | |
| **280** | 2.5 | | | 155 | | 0.24 | 4 | |
| **281** | 2 | | | 110 | | 0.22 | 3.6 | |
| **282** | 1.5 | | | 101 | | 0.19 | 3.6 | |
| **284** | 1.8 | | | 151 | | 0.21 | 3.8 | |
| **285** | 1.7 | | | 93 | | 0.19 | 4.7 | |
| **286** | 1.7 | | | 140 | | 0.17 | 4.9 | |
| **287** | 2.2 | | | 188 | | 0.2 | 5.4 | |
| **288** | 2.3 | | | 157 | | 0.23 | 4.3 | |
| **289** | 2.3 | | | 127 | | 0.22 | 4.6 | |
| **290** | 2.7 | | | 158 | | 0.23 | 6 | |
| **291** | 2.5 | | | 176 | | 0.23 | 5.2 | |
| **292** | 2.4 | | | 136 | | 0.22 | 5.1 | |
| **294** | 2.4 | | | 172 | | 0.21 | 3.7 | |
| **295** | 2.5 | | | 160 | | 0.21 | 5.4 | |
| **296** | 2.5 | | | 168 | | 0.24 | 4.3 | |
| **297** | 2.7 | | | 219 | | 0.25 | 5.1 | |
| **298** | 2.8 | | | 287 | | 0.24 | 4.9 | |
| **299** | 3.2 | | | 185 | | 0.26 | 4.9 | |

| **Element** | **Mg** | **Mn** | **Mo** | **Na** | **Nb** | **Ni** | **P** | **Pb** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **1** | **0.01** | **0.001** | **0.02** | **0.1** | **0.001** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** |
| **252** | 0.35 | 873 | 0.69 | 0.695 |  | 32.1 | 0.037 | 21.24 |
| **253** | 0.3 | 1333 | 1.21 | 0.679 | 0.02 | 31 | 0.065 | 20.26 |
| **254** | 0.31 | 2032 | 0.82 | 0.626 |  | 25.7 | 0.048 | 18.54 |
| **255** | 0.28 | 188 | 1.52 | 0.74 |  | 39 | 0.026 | 18.81 |
| **257** | 0.22 | 331 | 3.03 | 0.665 | 0.04 | 58.3 | 0.024 | 20.63 |
| **258** | 0.25 | 320 | 1.57 | 0.699 |  | 44.5 | 0.016 | 21.73 |
| **259** | 0.22 | 388 | 2.3 | 0.502 |  | 42.6 | 0.014 | 20.49 |
| **260** | 0.23 | 187 | 2.36 | 0.69 | 0.02 | 52.2 | 0.022 | 27.72 |
| **261** | 0.24 | 169 | 3.08 | 0.657 |  | 57.3 | 0.015 | 20.18 |
| **262** | 0.24 | 220 | 1.46 | 0.627 |  | 42.9 | 0.019 | 18.55 |
| **263** | 0.24 | 265 | 2.35 | 0.665 | 0.03 | 52.8 | 0.017 | 23.71 |
| **264** | 0.25 | 1028 | 2.88 | 0.651 |  | 50.3 | 0.017 | 19.28 |
| **265** | 0.23 | 552 | 2.37 | 0.654 |  | 48.8 | 0.018 | 19.85 |
| **266** | 0.23 | 806 | 1.89 | 0.623 | 0.02 | 41 | 0.025 | 19.99 |
| **267** | 0.01 | 322 | 0.55 | 0.02 |  | 133.3 | 0.002 | 26.03 |
| **268** | 0.25 | 528 | 2.28 | 0.682 |  | 49.6 | 0.029 | 21.21 |
| **269** | 0.41 | 2067 | 1.77 | 0.588 |  | 43.8 | 0.031 | 19.48 |
| **270** | 2.47 | 10005 | 0.8 | 0.139 |  | 10.3 | 0.404 | 5.31 |
| **271** | 0.26 | 713 | 1.7 | 0.623 |  | 48.1 | 0.023 | 19.16 |
| **272** | 0.26 | 1030 | 1.79 | 0.683 |  | 43.1 | 0.024 | 20.66 |
| **273** | 0.25 | 3145 | 1.69 | 0.648 | 0.02 | 38.8 | 0.083 | 19.38 |
| **274** | 0.27 | 1644 | 2.59 | 0.757 |  | 43.3 | 0.043 | 18.91 |
| **275** | 0.24 | 80 | 3.52 | 0.774 | 0.04 | 51.7 | 0.03 | 20.82 |
| **276** | 0.28 | 810 | 2.65 | 1.156 |  | 44.1 | 0.029 | 23.04 |
| **277** | 0.39 | 151 | 22.06 | 0.206 |  | 45.5 | 0.052 | 14.98 |
| **278** | 0.28 | 83 | 24.59 | 0.218 |  | 67.2 | 0.057 | 16.28 |
| **279** | 0.32 | 91 | 22.73 | 0.201 |  | 61.4 | 0.058 | 14.64 |
| **280** | 0.53 | 167 | 32.62 | 0.184 |  | 51.5 | 0.062 | 13.73 |
| **281** | 0.17 | 68 | 25.02 | 0.183 |  | 57 | 0.051 | 12.07 |
| **282** | 1.63 | 173 | 23.21 | 0.151 |  | 40.1 | 0.043 | 9.56 |
| **284** | 0.15 | 60 | 34.45 | 0.173 |  | 58 | 0.051 | 12.1 |
| **285** | 1.05 | 172 | 27.73 | 0.143 |  | 46.7 | 0.052 | 10.22 |
| **286** | 0.15 | 100 | 37.65 | 0.126 |  | 70.1 | 0.062 | 10.68 |
| **287** | 0.22 | 109 | 49.26 | 0.14 |  | 72.3 | 0.09 | 13.65 |
| **288** | 0.19 | 94 | 33.66 | 0.17 |  | 61.5 | 0.076 | 15.87 |
| **289** | 0.22 | 98 | 39.6 | 0.153 |  | 72.2 | 0.08 | 15.12 |
| **290** | 0.26 | 111 | 48.45 | 0.186 |  | 111 | 0.079 | 19.45 |
| **291** | 0.27 | 111 | 37.08 | 0.16 |  | 80.7 | 0.063 | 16.18 |
| **292** | 0.33 | 177 | 23.49 | 0.193 |  | 55.3 | 0.058 | 18.28 |
| **294** | 0.19 | 84 | 33.17 | 0.195 |  | 73.4 | 0.06 | 18.67 |
| **295** | 0.26 | 130 | 40.29 | 0.182 |  | 79.9 | 0.055 | 20.64 |
| **296** | 0.28 | 110 | 27.72 | 0.218 |  | 69.8 | 0.052 | 20.57 |
| **297** | 0.28 | 113 | 30.19 | 0.236 |  | 81.2 | 0.065 | 26.45 |
| **298** | 0.25 | 97 | 34.42 | 0.233 |  | 92.3 | 0.065 | 24.49 |
| **299** | 0.32 | 129 | 35.76 | 0.215 |  | 84.1 | 0.065 | 23.62 |

| **Element** | **Pd** | **Pt** | **Rb** | **Re** | **S** | **Sb** | **Sc** | **Se** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **10** | **2** | **0.1** | **1** | **0.02** | **0.02** | **0.1** | **0.1** |
| **Samples** | **ppb** | **ppb** | **ppm** | **ppb** | **%** | **ppm** | **ppm** | **ppm** |
| **252** | | | | | 1.67 | 0.11 | 4.4 | 0.7 |
| **253** | < 10 | < 2 | 23.1 | 1 | 1.14 | 0.14 | 4.2 | 0.8 |
| **254** | | | | | 1.12 | 0.16 | 3.7 | 0.5 |
| **255** | | | | | 1.25 | 0.23 | 4.3 | 1.2 |
| **257** | < 10 | < 2 | 19.3 | < 1 | 1.19 | 0.37 | 3.6 | 1.1 |
| **258** | | | | | 1.16 | 0.25 | 4.2 | 1.2 |
| **259** | | | | | 7.12 | 0.33 | 3.4 | 3.5 |
| **260** | < 10 | < 2 | 19.1 | < 1 | 0.69 | 0.31 | 3.9 | 0.9 |
| **261** | | | | | 1.21 | 0.27 | 4.3 | 1.6 |
| **262** | | | | | 3.33 | 0.29 | 4.5 | 2.2 |
| **263** | < 10 | < 2 | 18.7 | 2 | 0.61 | 0.26 | 4 | 1.1 |
| **264** | | | | | 1.17 | 0.21 | 4.3 | 1.6 |
| **265** | | | | | 1.21 | 0.25 | 4 | 1.4 |
| **266** | 10 | < 2 | 21 | < 1 | 0.48 | 0.23 | 4.2 | 0.9 |
| **267** | | | | | 31.24 | 1.68 | 0.3 | 5.6 |
| **268** | | | | | 0.43 | 0.25 | 4.6 | 0.8 |
| **269** | | | | | 0.45 | 0.27 | 3.8 | 1.3 |
| **270** | | | | | 0.09 | 0.17 | 2.8 | 0.5 |
| **271** | | | | | 0.3 | 0.19 | 3.6 | 0.9 |
| **272** | | | | | 0.3 | 0.27 | 5 | 1.4 |
| **273** | < 10 | < 2 | 19.5 | 4 | 0.19 | 0.31 | 5.6 | 1.4 |
| **274** | | | | | 0.31 | 0.29 | 4.9 | 1.8 |
| **275** | < 10 | < 2 | 17.8 | 1 | 0.24 | 0.36 | 4 | 2 |
| **276** | | | | | 0.21 | 0.38 | 3.1 | 2.4 |
| **277** | | | | | 3.05 | 0.73 | 5.8 | 2.4 |
| **278** | | | | | 3.48 | 1.04 | 4.8 | 3.6 |
| **279** | | | | | 3.06 | 0.98 | 6.2 | 3.8 |
| **280** | | | | | 2.84 | 0.74 | 5.9 | 3.6 |
| **281** | | | | | 2.94 | 0.88 | 5.1 | 3.6 |
| **282** | | | | | 2.33 | 0.72 | 4.3 | 2.8 |
| **284** | | | | | 2.67 | 1.12 | 4.8 | 4.2 |
| **285** | | | | | 1.74 | 0.98 | 4.7 | 3.2 |
| **286** | | | | | 2.75 | 1.38 | 4.9 | 5.1 |
| **287** | | | | | 3.4 | 1.85 | 5.4 | 5.4 |
| **288** | | | | | 2.97 | 1.63 | 4.6 | 4.6 |
| **289** | | | | | 3.39 | 1.45 | 4.8 | 5.2 |
| **290** | | | | | 4.67 | 2.67 | 5.3 | 7.7 |
| **291** | | | | | 3.41 | 1.91 | 4.9 | 5.8 |
| **292** | | | | | 2.72 | 1.49 | 5.8 | 3.8 |
| **294** | | | | | 3.29 | 2.12 | 3 | 4.6 |
| **295** | | | | | 2.94 | 1.84 | 5.4 | 4.7 |
| **296** | | | | | 2.13 | 1.61 | 5.4 | 4.3 |
| **297** | | | | | 2.8 | 2.1 | 4 | 7.4 |
| **298** | | | | | 3.26 | 2.38 | 3.5 | 7.1 |
| **299** | | | | | 2.81 | 2.12 | 4.2 | 5.6 |

| **Element** | **Sn** | **Sr** | **Ta** | **Te** | **Th** | **Ti** | **Tl** | **U** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.5** | **0.05** | **0.02** | **0.1** | **0.001** | **0.02** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **252** | | 113 | | 0.09 | 11.1 | 0.006 | 0.08 | 1.85 |
| **253** | 1.5 | 118.5 | < .05 | 0.09 | 10.5 | 0.002 | 0.12 | 2.45 |
| **254** | | 111.6 | | 0.07 | 10.5 | 0.003 | 0.1 | 2.07 |
| **255** | | 114.4 | | 0.1 | 11.6 | 0.004 | 0.09 | 4.79 |
| **257** | 1.4 | 108 | < .05 | 0.14 | 11.2 | 0.003 | 0.14 | 4.49 |
| **258** | | 112.4 | | 0.09 | 11.4 | < .001 | 0.11 | 4.64 |
| **259** | | 84.7 | | 0.1 | 8.1 | < .001 | 0.21 | 3.65 |
| **260** | 1.5 | 112.1 | < .05 | 0.08 | 11.9 | < .001 | 0.11 | 4.43 |
| **261** | | 105.2 | | 0.12 | 10.2 | < .001 | 0.18 | 4.39 |
| **262** | | 99.8 | | 0.07 | 9.6 | 0.008 | 0.11 | 4.44 |
| **263** | 1.6 | 110 | < .05 | 0.11 | 12.3 | 0.002 | 0.17 | 4.46 |
| **264** | | 105.9 | | 0.09 | 11.1 | 0.003 | 0.12 | 4.25 |
| **265** | | 104.9 | | 0.1 | 11 | < .001 | 0.12 | 4.52 |
| **266** | 1.3 | 105.4 | < .05 | 0.08 | 11.5 | 0.001 | 0.12 | 4.19 |
| **267** | | 5.2 | | < .02 | 0.6 | < .001 | 2.33 | 0.24 |
| **268** | | 145.3 | | 0.09 | 12 | 0.003 | 0.1 | 4.45 |
| **269** | | 104.2 | | 0.1 | 10.8 | 0.004 | 0.12 | 3.97 |
| **270** | | 148.1 | | 0.03 | 2.6 | 0.001 | 0.07 | 1.01 |
| **271** | | 110.1 | | 0.09 | 10.8 | 0.009 | 0.06 | 3.96 |
| **272** | | 115.1 | | 0.09 | 11.2 | < .001 | 0.08 | 4.13 |
| **273** | 1.2 | 131.6 | < .05 | 0.1 | 10.6 | 0.005 | 0.11 | 4.04 |
| **274** | | 129.9 | | 0.08 | 10.4 | < .001 | 0.08 | 4.1 |
| **275** | 1.4 | 133.9 | < .05 | 0.08 | 11.6 | 0.002 | 0.14 | 5.64 |
| **276** | | 196.3 | | 0.05 | 16.9 | 0.004 | 0.07 | 6.17 |
| **277** | | 100.6 | | 0.07 | 4.5 | < .001 | 0.12 | 3.63 |
| **278** | | 101.3 | | 0.08 | 4.3 | 0.002 | 0.24 | 3.4 |
| **279** | | 130.6 | | 0.09 | 4.2 | 0.004 | 0.18 | 3.95 |
| **280** | | 117.3 | | 0.09 | 4.2 | 0.001 | 0.09 | 8.22 |
| **281** | | 166.7 | | 0.12 | 3.7 | < .001 | 0.13 | 4.55 |
| **282** | | 180.1 | | 0.09 | 3.2 | 0.001 | 0.09 | 4.96 |
| **284** | | 253.8 | | 0.08 | 3.9 | < .001 | 0.14 | 7.54 |
| **285** | | 203.5 | | 0.07 | 3.3 | < .001 | 0.09 | 6.01 |
| **286** | | 222.4 | | 0.11 | 3.3 | < .001 | 0.2 | 10.29 |
| **287** | | 163.2 | | 0.1 | 4 | 0.005 | 0.14 | 15.18 |
| **288** | | 126.5 | | 0.1 | 4.4 | 0.006 | 0.16 | 7.94 |
| **289** | | 115.4 | | 0.11 | 4.3 | < .001 | 0.14 | 9.61 |
| **290** | | 99.3 | | 0.15 | 5.5 | 0.004 | 0.36 | 12.49 |
| **291** | | 160 | | 0.14 | 4.7 | < .001 | 0.16 | 10.35 |
| **292** | | 91.8 | | 0.12 | 5.9 | 0.002 | 0.21 | 5.19 |
| **294** | | 69.6 | | 0.11 | 4.8 | 0.006 | 0.65 | 7.76 |
| **295** | | 96.4 | | 0.13 | 6.2 | 0.002 | 0.4 | 10.66 |
| **296** | | 92.9 | | 0.12 | 6 | 0.006 | 0.45 | 5.87 |
| **297** | | 80.7 | | 0.16 | 7.2 | 0.007 | 0.53 | 4.91 |
| **298** | | 77.3 | | 0.2 | 6.8 | 0.004 | 0.69 | 4.57 |
| **299** | | 83.5 | | 0.17 | 6.4 | < .001 | 0.4 | 7.11 |

***Analysis: GROUP 1EX - 0.25 GM***

| **Element**<br>**LDL**<br>**Samples** | **V**<br>**2**<br>**ppm** | **W**<br>**0.1**<br>**ppm** | **Y**<br>**0.01**<br>**ppm** | **Zn**<br>**0.1**<br>**ppm** | **Zr**<br>**0.1**<br>**ppm** | **Ag**<br>**0.1**<br>**ppm** | **Al**<br>**0.01**<br>**%** | **As**<br>**1**<br>**ppm** |
|---|---|---|---|---|---|---|---|---|
| **252** | 23 | < .1 | | 92.5 | | | | |
| **253** | 19 | < .1 | 18.7 | 87 | 9.6 | 0.1 | 8.11 | 13 |
| **254** | 18 | < .1 | | 87 | | | | |
| **255** | 18 | < .1 | | 132.5 | | | | |
| **257** | 14 | < .1 | 17.53 | 156.8 | 10.8 | 0.1 | 8.55 | 21 |
| **258** | 18 | < .1 | | 128.7 | | | | |
| **259** | 18 | < .1 | | 120.4 | | | | |
| **260** | 17 | < .1 | 14.68 | 157 | 7.8 | 0.2 | 8.62 | 16 |
| **261** | 20 | < .1 | | 149.9 | | | | |
| **262** | 19 | < .1 | | 157.8 | | | | |
| **263** | 15 | < .1 | 17.13 | 147.6 | 8.7 | 0.2 | 8.82 | 15 |
| **264** | 20 | < .1 | | 134.1 | | | | |
| **265** | 18 | < .1 | | 143.5 | | | | |
| **266** | 18 | < .1 | 17.57 | 141.8 | 6.9 | 0.2 | 8.41 | 16 |
| **267** | 3 | < .1 | | 11.6 | | | | |
| **268** | 20 | < .1 | | 181 | | | | |
| **269** | 23 | < .1 | | 147.9 | | | | |
| **270** | 17 | 0.3 | | 36.3 | | | | |
| **271** | 20 | < .1 | | 144.4 | | | | |
| **272** | 22 | < .1 | | 139.2 | | | | |
| **273** | 18 | < .1 | 23.97 | 126 | 5 | 0.2 | 8.77 | 13 |
| **274** | 18 | < .1 | | 132.4 | | | | |
| **275** | 14 | < .1 | 15.96 | 154.9 | 5.8 | 0.2 | 8.23 | 11 |
| **276** | 13 | < .1 | | 152.2 | | | | |
| **277** | 42 | < .1 | | 116 | | 0.2 | 7.53 | 35 |
| **278** | 42 | < .1 | | 119.1 | | | | |
| **279** | 41 | < .1 | | 120.1 | | | | |
| **280** | 61 | < .1 | | 131.4 | | 0.2 | 7.25 | 31 |
| **281** | 37 | < .1 | | 132.1 | | | | |
| **282** | 64 | < .1 | | 109.6 | | | | |
| **284** | 35 | < .1 | | 175.3 | | | | |
| **285** | 91 | < .1 | | 121.9 | | | | |
| **286** | 49 | < .1 | | 142.6 | | | | |
| **287** | 56 | < .1 | | 163.9 | | | | |
| **288** | 48 | < .1 | | 142 | | | | |
| **289** | 52 | < .1 | | 127.7 | | | | |
| **290** | 65 | < .1 | | 246.8 | | | | |
| **291** | 59 | < .1 | | 147.9 | | | | |
| **292** | 55 | < .1 | | 138.6 | | | | |
| **294** | 38 | < .1 | | 157.4 | | | | |
| **295** | 50 | < .1 | | 192.3 | | | | |
| **296** | 51 | < .1 | | 136.4 | | | | |
| **297** | 50 | < .1 | | 213.1 | | | | |
| **298** | 55 | < .1 | | 234.4 | | | | |
| **299** | 58 | < .1 | | 187.3 | | | | |

| **Element** | **Au** | **Ba** | **Be** | **Bi** | **Ca** | **Cd** | **Ce** | **Co** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **1** | **1** | **0.1** | **0.01** | **0.1** | **1** | **1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **ppm** |
| **253** | < .1 | 383 | 4 | 0.5 | 0.32 | 0.2 | 58 | 17 |
| **257** | < .1 | 442 | 1 | 0.5 | 0.21 | 1.9 | 76 | 16 |
| **260** | < .1 | 467 | 2 | 0.5 | 0.19 | 1.9 | 71 | 16 |
| **263** | < .1 | 449 | 2 | 0.6 | 0.17 | 1.8 | 75 | 16 |
| **266** | < .1 | 467 | 4 | 0.5 | 0.18 | 1.9 | 76 | 15 |
| **273** | < .1 | 481 | 4 | 0.5 | 0.35 | 1.8 | 73 | 14 |
| **275** | < .1 | 487 | 5 | 0.6 | 0.27 | 2.3 | 58 | 13 |
| **277** | < .1 | 220 | 2 | 0.3 | 3.18 | 0.7 | 72 | 16 |
| **280** | < .1 | 246 | 3 | 0.3 | 4.41 | 1 | 70 | 16 |

| **Element** | **Cr** | **Cu** | **Fe** | **Hf** | **K** | **La** | **Li** | **Mg** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **0.01** | **0.1** | **0.01** | **0.1** | **0.1** | **0.01** |
| **Samples** | **ppm** | **ppm** | **%** | **ppm** | **%** | **ppm** | **ppm** | **%** |
| **253** | 86.8 | 34.3 | 4.19 | 3.7 | 1.72 | 22.7 | 66.8 | 0.82 |
| **257** | 80.6 | 38.5 | 3.78 | 3.4 | 1.6 | 31.2 | 62.5 | 0.7 |
| **260** | 79.7 | 41.9 | 3.27 | 3.8 | 1.61 | 28.6 | 68.4 | 0.67 |
| **263** | 76.2 | 39.9 | 3.45 | 4 | 1.66 | 31 | 69.6 | 0.67 |
| **266** | 77.6 | 37.8 | 3.45 | 3.7 | 1.67 | 31 | 69.2 | 0.64 |
| **273** | 85.9 | 43.3 | 4.86 | 3.6 | 1.62 | 30.2 | 62.1 | 0.69 |
| **275** | 82.7 | 51 | 3.12 | 4 | 1.59 | 22.5 | 57.8 | 0.76 |
| **277** | 119.9 | 33.3 | 5.25 | 2.6 | 2.2 | 41.5 | 82.5 | 0.73 |
| **280** | 110.7 | 38 | 5.74 | 2.2 | 2.06 | 38.3 | 77.3 | 0.84 |

| **Element** | **Mn** | **Mo** | **Na** | **Nb** | **Ni** | **P** | **Pb** | **Rb** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **1** | **0.1** | **0.001** | **0.1** | **0.1** | **0.001** | **0.1** | **0.1** |
| **Samples** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **253** | 1530 | 1.2 | 0.86 | 13.2 | 39.1 | 0.07 | 26.5 | 78.1 |
| **257** | 404 | 4 | 0.855 | 13.3 | 65 | 0.032 | 24.9 | 94.2 |
| **260** | 246 | 2.8 | 0.887 | 13.1 | 60.4 | 0.029 | 32.4 | 88.9 |
| **263** | 323 | 2.8 | 0.868 | 12.6 | 61.9 | 0.024 | 28.9 | 90.5 |
| **266** | 869 | 2.7 | 0.825 | 13 | 47 | 0.034 | 26.5 | 97 |
| **273** | 3436 | 2.2 | 0.869 | 11 | 46.9 | 0.093 | 25.4 | 93.6 |
| **275** | 130 | 3.5 | 0.992 | 11.8 | 55.8 | 0.035 | 24.6 | 80.3 |
| **277** | 173 | 23.8 | 0.395 | 12.4 | 52.1 | 0.075 | 19.4 | 125.5 |
| **280** | 177 | 35.8 | 0.358 | 11.7 | 52.4 | 0.08 | 17.9 | 129.6 |

| **Element** | **S** | **Sb** | **Sc** | **Sn** | **Sr** | **Ta** | **Th** | **Ti** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **1** | **0.1** | **1** | **0.1** | **0.1** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **253** | 1.3 | 0.4 | 11 | 2.9 | 153 | 0.9 | 9.9 | 0.459 |
| **257** | 1.4 | 1 | 12 | 2.6 | 151 | 0.9 | 13.5 | 0.402 |
| **260** | 0.7 | 0.8 | 11 | 3.3 | 155 | 1.1 | 13.2 | 0.426 |
| **263** | 0.6 | 0.7 | 12 | 3 | 156 | 1 | 14.2 | 0.421 |
| **266** | 0.4 | 0.7 | 11 | 2.8 | 152 | 1 | 13.3 | 0.439 |
| **273** | 0.1 | 1.1 | 13 | 3.1 | 169 | 0.9 | 12.8 | 0.393 |
| **275** | 0.1 | 1 | 11 | 2.8 | 176 | 1 | 11.8 | 0.377 |
| **277** | 3.2 | 1.6 | 14 | 2.6 | 213 | 0.8 | 11.7 | 0.439 |
| **280** | 2.9 | 1.9 | 14 | 2.3 | 215 | 0.8 | 10 | 0.412 |

***Analysis: GROUP 4B - REE - 0.200 GM***

| **Element** | **U** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ce** | **Co** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **1** | **0.1** | **0.1** | **1** | **0.1** | **0.5** | **0.5** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **253** | 4 | 131 | 1.8 | 18.9 | 107 | 100.6 | 95 | 16.9 |
| **257** | 6.1 | 129 | 1.6 | 23.8 | 177 | 101.7 | 94.4 | 15.7 |
| **260** | 5.9 | 131 | 1.8 | 19.8 | 176 | 102 | 88.8 | 14.7 |
| **263** | 5.8 | 129 | 1.9 | 22 | 163 | 105.2 | 97.7 | 16.3 |
| **266** | 5.7 | 135 | 1.9 | 22.8 | 164 | 107 | 100.7 | 15.4 |
| **273** | 5.7 | 135 | 1.9 | 30.8 | 145 | 97.6 | 87.6 | 13 |
| **275** | 6.9 | 145 | 2.5 | 19.6 | 173 | 90.8 | 83.8 | 14.1 |
| **277** | 7.6 | 237 | 1.3 | 21.9 | 137 | 69.5 | 86.1 | 16.3 |
| **280** | 13.8 | 270 | 1.4 | 21 | 160 | 59.2 | 77.6 | 17.7 |

| **Element** | **Cs** | **Dy** | **Er** | **Eu** | **Ga** | **Gd** | **Hf** | **Ho** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.05** | **0.05** | **0.05** | **0.5** | **0.05** | **0.5** | **0.05** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **253** | 7.1 | 5.69 | 3.24 | 1.63 | 22.5 | 6.63 | 5.8 | 1.2 |
| **257** | 7.8 | 6.41 | 3.55 | 1.59 | 21.2 | 6.16 | 5.8 | 1.33 |
| **260** | 7.3 | 5.13 | 3.32 | 1.39 | 22.1 | 5.96 | 5.8 | 1.1 |
| **263** | 7.6 | 6.33 | 3.53 | 1.63 | 23.4 | 6.94 | 5.8 | 1.31 |
| **266** | 7.8 | 6.8 | 3.68 | 1.66 | 22.8 | 6.94 | 5.6 | 1.4 |
| **273** | 7.3 | 6.31 | 3.82 | 1.55 | 20.1 | 7.2 | 4.3 | 1.31 |
| **275** | 7.8 | 5.31 | 3.18 | 1.55 | 21.9 | 6.21 | 4.7 | 1.07 |
| **277** | 10.6 | 5.21 | 2.96 | 1.37 | 22.9 | 5.55 | 4.6 | 1.03 |
| **280** | 9.1 | 4.36 | 2.65 | 1.2 | 19.9 | 5.09 | 3.6 | 0.93 |

| **Element** | **La** | **Lu** | **Nb** | **Nd** | **Pr** | **Sn** | **Rb** | **Sm** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.5** | **0.01** | **0.5** | **0.4** | **0.02** | **1** | **0.5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **253** | 44.1 | 0.46 | 17 | 40.4 | 10.56 | 3 | 108.7 | 7.5 |
| **257** | 43.3 | 0.49 | 18.6 | 40.3 | 10.97 | 2 | 108 | 7.9 |
| **260** | 41.1 | 0.47 | 17.7 | 38.7 | 10.31 | 2 | 102.3 | 7 |
| **263** | 44.6 | 0.48 | 18 | 43.5 | 11.28 | 3 | 104.3 | 8 |
| **266** | 46.3 | 0.46 | 19.2 | 43.8 | 11.7 | 3 | 112.1 | 8.6 |
| **273** | 40.8 | 0.52 | 16.4 | 40.3 | 10.35 | 3 | 102.4 | 7.8 |
| **275** | 39.5 | 0.4 | 16.5 | 38.4 | 9.91 | 3 | 103 | 7.5 |
| **277** | 43 | 0.42 | 16.4 | 36 | 10.21 | < 1 | 148.2 | 7 |
| **280** | 39.3 | 0.37 | 14.3 | 32.6 | 9.02 | < 1 | 137.2 | 6.2 |

| **Element** | **Sr** | **Ta** | **Tb** | **Th** | **Tm** | **U** | **V** | **W** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.5** | **0.1** | **0.01** | **0.1** | **0.05** | **0.1** | **5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **253** | 172 | 1.1 | 1.1 | 15.6 | 0.52 | 4.5 | 120 | 2.2 |
| **257** | 159.6 | 1.1 | 1.16 | 16.7 | 0.63 | 7.3 | 123 | 2.3 |
| **260** | 163.4 | 1 | 1.06 | 16.5 | 0.52 | 7.1 | 124 | 2.1 |
| **263** | 162.9 | 1.2 | 1.22 | 16.5 | 0.58 | 6.3 | 121 | 2.6 |
| **266** | 170.5 | 1.2 | 1.33 | 17 | 0.58 | 6.8 | 129 | 2.5 |
| **273** | 172.4 | 1.1 | 1.32 | 15 | 0.57 | 6 | 122 | 2 |
| **275** | 194.5 | 1.1 | 1.06 | 15.6 | 0.5 | 7.6 | 135 | 2.7 |
| **277** | 245.3 | 1 | 0.87 | 13.9 | 0.42 | 8.8 | 253 | 1.7 |
| **280** | 243.2 | 1 | 0.79 | 11 | 0.4 | 13.2 | 262 | 1.3 |

***Analysis: GROUP 4A - 0.200 GM***

| **Element** | **Y** | **Yb** | **Zr** | **Al2O3** | **Ba** | **CaO** | **Cr2O3** | **Cr2O3** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.05** | **0.5** | **0.03** | **5** | **0.01** | **0.001** | **0.001** |
| **Samples** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **%** | **%** | **%** |
| **253** | 33.7 | 3.49 | 198.7 | 17.2 | 462 | 0.52 | 0.011 | 0.0119 |
| **257** | 35.6 | 3.63 | 176.8 | 16.79 | 455 | 0.32 | 0.01 | 0.0104 |
| **260** | 32.1 | 3.19 | 177 | 17.03 | 469 | 0.31 | 0.01 | 0.0102 |
| **263** | 36.3 | 3.41 | 179.3 | 17.31 | 476 | 0.28 | 0.01 | 0.01 |
| **266** | 39.1 | 3.45 | 186.6 | 16.91 | 481 | 0.29 | 0.008 | 0.0103 |
| **273** | 40.8 | 3.54 | 143.2 | 16.82 | 474 | 0.53 | 0.011 | 0.0103 |
| **275** | 29.8 | 2.95 | 136.6 | 16.61 | 509 | 0.43 | 0.008 | 0.0103 |
| **277** | 32.5 | 2.89 | 139.5 | 15.67 | 934 | 4.57 | 0.015 | |
| **280** | 28.7 | 2.72 | 115.9 | 14.91 | 912.7 | 6.21 | 0.015 | |

| **Element** | **Fe2O3** | **K2O** | **LOI** | **MgO** | **MnO** | **Na2O** | **Ni** | **P2O5** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.04** | **0.04** | **0.1** | **0.01** | **0.01** | **0.01** | **30** | **0.01** |
| **Samples** | **%** | **%** | **%** | **%** | **%** | **%** | **ppm** | **%** |
| **253** | 5.68 | 2.25 | 12.7 | 1.5 | 0.18 | 1.21 | 40 | 0.18 |
| **257** | 5.14 | 2.1 | 11.4 | 1.28 | 0.05 | 1.15 | 53 | 0.09 |
| **260** | 4.46 | 2.07 | 11.3 | 1.22 | 0.03 | 1.19 | 50 | 0.07 |
| **263** | 4.72 | 2.06 | 10.8 | 1.22 | 0.04 | 1.22 | 57 | 0.07 |
| **266** | 4.63 | 2.12 | 10.3 | 1.18 | 0.1 | 1.12 | 49 | 0.09 |
| **273** | 6.99 | 2.05 | 11.9 | 1.22 | 0.39 | 1.11 | 44 | 0.22 |
| **275** | 4.22 | 1.99 | 11.5 | 1.38 | 0.02 | 1.33 | 46 | 0.08 |
| **277** | 7.1 | 2.57 | 13.9 | 1.39 | 0.02 | 0.59 | 53 | 0.16 |
| **280** | 7.88 | 2.6 | 16.3 | 1.58 | 0.02 | 0.49 | 56 | 0.18 |

|  |  |  |  |  |  |  | ***Analysis: CO2*** |  |
|---|---|---|---|---|---|---|---|---|
| **Element** | **Sc** | **SiO2** | **TiO2** | **TOT/C** | **TOT/S** | **SUM** | **C/ORG** | **C/GRA** |
| **LDL** | **1** | **0.02** | **0.01** | **0.01** | **0.01** |  |  |  |
| **Samples** | **ppm** | **%** | **%** | **%** | **%** | **%** | **%** | **%** |
| **253** | 14 | 57.54 | 0.8 | 1.58 | 1.52 | 99.82 | 1.53 | 0.02 |
| **257** | 13 | 60.65 | 0.78 | 1.48 | 1.52 | 99.81 | 1.45 | 0.02 |
| **260** | 13 | 61.24 | 0.78 | 1.73 | 0.9 | 99.77 | 1.69 | 0.03 |
| **263** | 14 | 61.17 | 0.81 | 1.53 | 0.77 | 99.77 | 1.51 | < .02 |
| **266** | 14 | 62.17 | 0.84 | 1.75 | 0.67 | 99.81 | 1.61 | 0.04 |
| **273** | 15 | 57.75 | 0.75 | 2.22 | 0.29 | 99.8 | 1.68 | < .02 |
| **275** | 13 | 61.55 | 0.66 | 2.47 | 0.37 | 99.84 | 2.4 | 0.04 |
| **277** | 16 | 52.61 | 0.74 | 4.2 | 3.58 | 99.34 | 3.03 | 0.04 |
| **280** | 16 | 48.58 | 0.68 | 6.29 | 3.4 | 99.45 | 4.52 | 0.08 |

| **Element** | **CO2** | **SO4** |
|---|---|---|
| **LDL** |  |  |
| **Samples** | **%** | **%** |
| **253** | 0.11 | 0.73 |
| **257** | 0.05 | 0.41 |
| **260** | 0.06 | 0.17 |
| **263** | 0.03 | 0.17 |
| **266** | 0.4 | 0.2 |
| **273** | 1.95 | 0.26 |
| **275** | 0.1 | 0.23 |
| **277** | 4.14 | 3 |
| **280** | 6.22 | 2.97 |

| **Samples** | **Hole** | **Latitude** | **Longitude** | **From (m)** | **To (m)** | **Analysis Date** |
|---|---|---|---|---|---|---|
| **300** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1563.765 | 1563.770 | Dec. 2003 |
| **300** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1563.765 | 1563.770 | April 2004 |
| **302** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1564.770 | 1564.775 | Dec. 2003 |
| **303** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1565.775 | 1565.780 | Dec. 2003 |
| **307** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1566.710 | 1566.715 | Dec. 2003 |
| **308** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1567.690 | 1567.695 | Dec. 2003 |
| **309** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1568.700 | 1568.705 | Dec. 2003 |
| **310** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1570.440 | 1570.445 | Dec. 2003 |
| **311** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1570.990 | 1571.030 | Dec. 2003 |
| **312** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1571.440 | 1571.445 | Dec. 2003 |
| **313** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1573.205 | 1573.210 | Dec. 2003 |
| **314** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1574.170 | 1574.175 | Dec. 2003 |
| **315** | 00/16-12-046-03W5/0 | 52.957954 | -114.293665 | 1575.175 | 1575.180 | Dec. 2003 |
| **316** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1539.450 | 1539.455 | Dec. 2003 |
| **317** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1540.485 | 1540.490 | Dec. 2003 |
| **318** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1541.445 | 1541.450 | Dec. 2003 |
| **319** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1542.450 | 1542.455 | Dec. 2003 |
| **320** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1543.490 | 1543.495 | Dec. 2003 |
| **321** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1544.370 | 1544.375 | Dec. 2003 |
| **322** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1545.450 | 1545.455 | Dec. 2003 |
| **323** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1546.090 | 1546.095 | Dec. 2003 |
| **324** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1546.975 | 1546.980 | Dec. 2003 |
| **325** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1547.870 | 1547.875 | Dec. 2003 |
| **326** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1548.745 | 1548.750 | Dec. 2003 |
| **327** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1549.830 | 1549.835 | Dec. 2003 |
| **328** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1550.880 | 1550.885 | Dec. 2003 |
| **329** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1551.950 | 1551.955 | Dec. 2003 |
| **330** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1552.810 | 1552.815 | Dec. 2003 |
| **332** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1554.210 | 1554.215 | Dec. 2003 |
| **333** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1555.010 | 1555.020 | Dec. 2003 |
| **334** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1555.910 | 1555.915 | Dec. 2003 |
| **335** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1557.010 | 1557.015 | Dec. 2003 |
| **336** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1558.010 | 1558.015 | Dec. 2003 |
| **338** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1558.885 | 1558.890 | Dec. 2003 |
| **339** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1557.010 | 1557.015 | Dec. 2003 |
| **340** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1561.040 | 1561.045 | Dec. 2003 |
| **341** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1561.945 | 1561.950 | Dec. 2003 |
| **342** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1563.135 | 1563.140 | Dec. 2003 |
| **343** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1564.155 | 1564.160 | Dec. 2003 |
| **344** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1565.100 | 1565.105 | Dec. 2003 |
| **345** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1566.110 | 1566.115 | Dec. 2003 |
| **346** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1566.660 | 1566.665 | Dec. 2003 |
| **347** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1567.070 | 1567.080 | Dec. 2003 |
| **348** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1567.820 | 1567.825 | Dec. 2003 |
| **349** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1569.490 | 1569.495 | Dec. 2003 |
| **350** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1570.365 | 1570.370 | Dec. 2003 |
| **351** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1571.650 | 1571.655 | Dec. 2003 |
| **352** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1572.690 | 1572.695 | Dec. 2003 |
| **353** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1573.910 | 1573.915 | Dec. 2003 |
| **354** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1576.470 | 1576.475 | Dec. 2003 |
| **355** | 00/14-29-048-06W5/0 | 53.176285 | -114.844461 | 1577.250 | 1577.255 | Dec. 2003 |

| Samples | Probability of Fm | Formation | Sample Description |
|---|---|---|---|
| 300 | Possible | Top of Belle Fourche | Dk grey shale, some silt, some micas, black fragments |
| 300 | Possible | Top of Belle Fourche | Dk grey shale, some silt, some micas, black fragments |
| 302 | Possible | Top of Belle Fourche | Dk grey shale, fish fragments, some silt |
| 303 | Possible | Top of Belle Fourche | Dk grey shale, broken, micas, minor silt, smooth |
| 307 | Possible | Top of Belle Fourche | Dk grey shale, micas, minor silt |
| 308 | Possible | Top of Belle Fourche | Dk grey shale, silt, micas |
| 309 | Possible | Top of Belle Fourche | Dk grey shale, some silt, some micas, fish debris |
| 310 | Possible | Top of Belle Fourche | Dk grey shale, some wisps of silt |
| 311 | Possible | Top of Belle Fourche | Dk grey shale |
| 312 | Possible | Belle Fourche | Dk grey shale, micas, minor silt |
| 313 | Possible | Belle Fourche | Dk grey shale, micas, wisps of silt |
| 314 | Possible | Belle Fourche | Dk grey shale, silty wisps, shelly debris |
| 315 | Possible | Belle Fourche | Dk grey shale, some silt, some micas |
| 316 | Unknown | Second White Specks | Dk grey shale, shelly debris |
| 317 | Unknown | Second White Specks | Dk grey shale, smooth, small amount of silt |
| 318 | Unknown | Second White Specks | Dk grey shale, fish fragments, shelly remains |
| 319 | Unknown | Second White Specks | Dk grey shale, shelly material, some silt |
| 320 | Unknown | Second White Specks | Dk grey shale, some shelly fragments, minor silt |
| 321 | Unknown | Second White Specks | Dk grey shale, minor silt |
| 322 | Unknown | Second White Specks | Dk grey shale, some shells, some silt |
| 323 | Unknown | Second White Specks | Dk grey shale, some micas, some silt |
| 324 | Unknown | Second White Specks | Dk grey shale, abundant shells |
| 325 | Unknown | Second White Specks | Dk grey shale, silty wisps |
| 326 | Unknown | Second White Specks | Dk grey shale, some fish fragments, minor silt |
| 327 | Unknown | Second White Specks | Dk grey shale, shell fragments, some silt |
| 328 | Unknown | Second White Specks | Dk grey shale, some fish fragments, silty |
| 329 | Unknown | Second White Specks | Dk grey shale, fish fragments, some silt |
| 330 | Unknown | Second White Specks | Dk grey shale, silt |
| 332 | Unknown | Second White Specks | Dk grey shale, small amount of micas |
| 333 | Unknown | Second White Specks | Dk grey shale, some silt, smooth |
| 334 | Unknown | Second White Specks | Dk grey shale, shelly fragments |
| 335 | Unknown | Second White Specks | Dk grey shale, silty |
| 336 | Unknown | Second White Specks | Dk grey shale, silty lams |
| 338 | Unknown | Second White Specks | Dk grey shale, shelly material |
| 339 | Unknown | Second White Specks | Dk grey shale, silt, fish fragments |
| 340 | Unknown | Second White Specks | Dk grey shale, organic fragments, some silt |
| 341 | Unknown | Second White Specks | Dk grey shale, minor silt |
| 342 | Unknown | Second White Specks | Dk grey shale, a little silt, micas |
| 343 | Unknown | Second White Specks | Dk grey shale, minor silt and micas |
| 344 | Unknown | Second White Specks | Dk grey shale, fish fragments |
| 345 | Unknown | Second White Specks | Dk grey, fish fragments, lams of silt |
| 346 | Unknown | Second White Specks | Dk grey shale, some shelly fragments |
| 347 | Unknown | Second White Specks | Pyrite lense |
| 348 | Unknown | Second White Specks | Dk grey shale, silty |
| 349 | Unknown | Second White Specks | Dk grey shale, fish scales, small amount of silt, smooth |
| 350 | Unknown | Second White Specks | Dk grey shale, fish fragments, shelly debris |
| 351 | Unknown | Second White Specks | Dk grey shale, some shelly fragments |
| 352 | Unknown | Second White Specks | Dk grey shale, minor fish fragments, minor silt |
| 353 | Unknown | Second White Specks | Dk grey shale, organic fragments, some silt |
| 354 | Unknown | Second White Specks | Dk grey shale, a little shelly fragments |
| 355 | Unknown | Second White Specks | Dk grey shale, silt, organic fragments |

***Analysis: GROUP 1F1 - 1.00 GM***

| **Element** | **Ag** | **Al** | **As** | **Au** | **B** | **Ba** | **Be** | **Bi** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** | **0.1** | **0.02** |
| **Samples** | **ppb** | **%** | **ppm** | **ppb** | **ppm** | **ppm** | **ppm** | **ppm** |
| **300** | 635 | 1.17 | 29.9 | < .2 | 6 | 36.4 | | 0.51 |
| **302** | 399 | 1.05 | 24.2 | 0.3 | 8 | 58.4 | | 0.45 |
| **303** | 309 | 1.04 | 27.9 | < .2 | 8 | 55.3 | | 0.51 |
| **307** | 547 | 1.1 | 23.3 | 0.9 | 8 | 49.7 | | 0.39 |
| **308** | 655 | 1.14 | 37.1 | 0.2 | 5 | 30 | | 0.44 |
| **309** | 620 | 1.08 | 41.5 | 0.4 | 6 | 29.1 | | 0.47 |
| **310** | 467 | 1.17 | 28.5 | 0.4 | 6 | 38.4 | | 0.42 |
| **311** | 213 | 0.55 | 15.4 | 0.3 | 5 | 84.2 | | 0.22 |
| **312** | 417 | 1.19 | 31.3 | 0.4 | 8 | 41.1 | | 0.48 |
| **313** | 410 | 1.15 | 28.9 | 0.6 | 10 | 49.9 | | 0.4 |
| **314** | 400 | 1.16 | 30.5 | 0.6 | 10 | 53.7 | | 0.39 |
| **315** | 348 | 1.19 | 30.2 | 0.2 | 9 | 52.6 | | 0.39 |
| **316** | 349 | 1.26 | 29.6 | < .2 | 14 | 57.9 | 0.8 | 0.3 |
| **317** | 275 | 1.08 | 28 | < .2 | 11 | 56 | | 0.26 |
| **318** | 257 | 1.04 | 22.9 | 0.5 | 11 | 68 | | 0.21 |
| **319** | 281 | 0.99 | 25.4 | 0.3 | 14 | 61.3 | | 0.24 |
| **320** | 292 | 1.19 | 21.8 | 0.2 | 13 | 77.5 | 0.8 | 0.29 |
| **321** | 283 | 0.9 | 25.9 | 0.3 | 10 | 58.6 | | 0.23 |
| **322** | 249 | 0.93 | 24.9 | < .2 | 11 | 67.1 | | 0.22 |
| **323** | 295 | 0.89 | 28.4 | < .2 | 12 | 48.5 | | 0.25 |
| **324** | 248 | 0.71 | 21.2 | < .2 | 10 | 120 | | 0.2 |
| **325** | 350 | 0.85 | 24.8 | 0.3 | 11 | 58.2 | 0.7 | 0.28 |
| **326** | 301 | 0.8 | 23.7 | 0.4 | 12 | 53.5 | | 0.23 |
| **327** | 295 | 0.79 | 26.2 | 0.5 | 12 | 48.4 | | 0.25 |
| **328** | 333 | 0.73 | 23.7 | 0.6 | 10 | 57.8 | | 0.25 |
| **329** | 364 | 0.97 | 24.3 | 1.1 | 14 | 65 | 0.7 | 0.26 |
| **330** | 342 | 0.7 | 24.4 | < .2 | 12 | 45.4 | | 0.24 |
| **332** | 339 | 0.73 | 23.3 | 0.4 | 10 | 56.2 | | 0.25 |
| **333** | 372 | 0.66 | 36 | 0.4 | 10 | 35.2 | | 0.3 |
| **334** | 315 | 0.74 | 26.5 | 0.3 | 11 | 72.3 | 0.5 | 0.21 |
| **335** | 293 | 0.63 | 25.7 | 0.3 | 11 | 64.6 | | 0.2 |
| **336** | 266 | 0.45 | 18.4 | < .2 | 6 | 87.1 | | 0.16 |
| **338** | 318 | 0.59 | 42.6 | 1.4 | 5 | 32.6 | | 0.2 |
| **339** | 313 | 0.85 | 18.6 | < .2 | 13 | 81.5 | 0.6 | 0.27 |
| **340** | 281 | 0.66 | 15.8 | < .2 | 6 | 71.6 | | 0.23 |
| **341** | 298 | 0.76 | 13.3 | 0.8 | 8 | 83 | | 0.24 |
| **342** | 300 | 0.94 | 28.4 | 0.2 | 12 | 56.2 | 0.7 | 0.25 |
| **343** | 331 | 0.62 | 20.4 | 0.4 | 8 | 50 | | 0.2 |
| **344** | 297 | 0.65 | 27.9 | 0.5 | 6 | 42.9 | | 0.22 |
| **345** | 264 | 0.57 | 25.5 | 0.4 | 6 | 51.8 | | 0.19 |
| **346** | 476 | 0.56 | 27.6 | 0.4 | 9 | 47.1 | | 0.21 |
| **347** | 284 | 0.44 | 460 | < .2 | 4 | 6.3 | | 0.18 |
| **348** | 321 | 0.82 | 32.1 | < .2 | 12 | 50.9 | 0.5 | 0.25 |
| **349** | 237 | 0.69 | 30.4 | 0.4 | 8 | 32.2 | | 0.27 |
| **350** | 247 | 0.54 | 25.9 | < .2 | 9 | 40.2 | | 0.22 |
| **351** | 368 | 0.85 | 31.8 | 0.7 | 13 | 48.1 | 0.6 | 0.27 |
| **352** | 263 | 0.69 | 28.4 | < .2 | 9 | 39.7 | | 0.21 |
| **353** | 235 | 0.85 | 23.7 | < .2 | 7 | 32.8 | | 0.25 |
| **354** | 200 | 1.19 | 24.4 | 0.6 | 13 | 56.8 | 0.7 | 0.29 |
| **355** | 185 | 0.92 | 21.8 | 0.4 | 6 | 37.6 | | 0.27 |

| **Element**<br>**LDL**<br>**Samples** | **Ca**<br>**0.01**<br>**%** | **Cd**<br>**0.01**<br>**ppm** | **Ce**<br>**0.1**<br>**ppm** | **Co**<br>**0.1**<br>**ppm** | **Cr**<br>**0.5**<br>**ppm** | **Cs**<br>**0.02**<br>**ppm** | **Cu**<br>**0.01**<br>**ppm** | **Fe**<br>**0.01**<br>**%** |
|---|---|---|---|---|---|---|---|---|
| **300** | 1.04 | 7.48 | | 19.6 | 17.8 | | 68.38 | 3.75 |
| **302** | 0.26 | 1.53 | | 15.5 | 16.4 | | 54 | 2.64 |
| **303** | 0.84 | 1.09 | | 14.1 | 14.9 | | 43.41 | 3.09 |
| **307** | 0.3 | 1.75 | | 16.9 | 18.3 | | 58.05 | 2.96 |
| **308** | 0.38 | 2.3 | | 22.7 | 18.5 | | 70.94 | 3.86 |
| **309** | 0.27 | 2.18 | | 22.8 | 17.5 | | 66.39 | 4.13 |
| **310** | 0.25 | 1.73 | | 19.7 | 19.2 | | 59.41 | 3.45 |
| **311** | 2.19 | 0.7 | | 10.6 | 17.5 | | 27.88 | 16.75 |
| **312** | 0.26 | 1 | | 20.6 | 18.6 | | 58.21 | 3.54 |
| **313** | 0.23 | 1.48 | | 18.3 | 19.7 | | 55.22 | 3.38 |
| **314** | 0.63 | 1.67 | | 18.7 | 20.6 | | 54.94 | 3.28 |
| **315** | 0.26 | 1.11 | | 19.3 | 19.1 | | 52.15 | 3.48 |
| **316** | 2.5 | 1.1 | 10.7 | 12.9 | 21.2 | 1.46 | 53.02 | 2.83 |
| **317** | 3.46 | 0.75 | | 13.5 | 16.2 | | 36.13 | 2.81 |
| **318** | 3.22 | 1.22 | | 12.7 | 15.7 | | 30.51 | 2.31 |
| **319** | 3.57 | 0.68 | | 13.5 | 16.7 | | 33.11 | 2.6 |
| **320** | 3.58 | 1.41 | 12.2 | 12.4 | 19.2 | 1.4 | 39.13 | 2.33 |
| **321** | 4.35 | 1 | | 13.6 | 15.2 | | 33.45 | 2.52 |
| **322** | 3.73 | 1.33 | | 12.7 | 14.8 | | 29.53 | 2.26 |
| **323** | 3.89 | 1.22 | | 13.4 | 16.1 | | 32.59 | 2.57 |
| **324** | 11.37 | 1.49 | | 10.9 | 12.7 | | 28.32 | 2.09 |
| **325** | 6.32 | 1.24 | 11.4 | 13 | 15.3 | 1.08 | 39.44 | 2.49 |
| **326** | 4.56 | 1.14 | | 12 | 13.8 | | 31.59 | 2.41 |
| **327** | 4.88 | 1.04 | | 13.5 | 13.1 | | 34.16 | 2.65 |
| **328** | 4.61 | 1.37 | | 13.2 | 13.3 | | 33.71 | 2.35 |
| **329** | 5.32 | 0.99 | 11.2 | 13.3 | 16.6 | 1.14 | 38.54 | 2.55 |
| **330** | 5.28 | 1.31 | | 14 | 12.4 | | 37.6 | 2.72 |
| **332** | 4.93 | 1.68 | | 13 | 13.1 | | 37.84 | 2.36 |
| **333** | 3.93 | 1.31 | | 15.7 | 12.2 | | 42.09 | 3.05 |
| **334** | 10.29 | 1.19 | 13.2 | 12.3 | 14.5 | 0.96 | 34.82 | 2.63 |
| **335** | 7.36 | 1.29 | | 12.1 | 11.2 | | 30.95 | 2.38 |
| **336** | 8.37 | 1.08 | | 8.9 | 10.9 | | 27.2 | 2.08 |
| **338** | 5.67 | 1.63 | | 11.1 | 9.7 | | 32.53 | 3.42 |
| **339** | 4.59 | 1.45 | 10.7 | 12.3 | 14.5 | 1.26 | 35.81 | 2 |
| **340** | 3.97 | 2.5 | | 9.9 | 12.4 | | 35.32 | 1.78 |
| **341** | 3.52 | 1.17 | | 9.3 | 13.2 | | 34.59 | 1.7 |
| **342** | 5.59 | 1.23 | 12 | 14.1 | 15.4 | 1.08 | 38.65 | 2.66 |
| **343** | 4.67 | 2 | | 11 | 11.7 | | 33.2 | 2.27 |
| **344** | 4.66 | 1.27 | | 13.3 | 12.2 | | 32.28 | 2.58 |
| **345** | 6.92 | 1.46 | | 10.8 | 10.7 | | 28.3 | 2.48 |
| **346** | 5.62 | 2.6 | | 16.6 | 11.6 | | 42.51 | 2.57 |
| **347** | 4.25 | 1.16 | | 11.5 | 9.8 | | 26.93 | 14.32 |
| **348** | 6.62 | 1.44 | 13.3 | 15 | 12.6 | 1 | 38.84 | 2.87 |
| **349** | 3.28 | 0.89 | | 13 | 13.1 | | 30.26 | 3.31 |
| **350** | 5.6 | 0.81 | | 12.5 | 12.8 | | 30.16 | 2.99 |
| **351** | 4.95 | 1.89 | 12.8 | 19.6 | 14.1 | 1.14 | 50.16 | 3.17 |
| **352** | 5.26 | 1.12 | | 14.9 | 13.6 | | 33.18 | 3.18 |
| **353** | 1.42 | 0.92 | | 12.5 | 15.4 | | 34.22 | 3.11 |
| **354** | 0.99 | 0.52 | 9.2 | 12.8 | 21.8 | 1.58 | 33.58 | 3.13 |
| **355** | 0.92 | 0.61 | | 12.8 | 18.3 | | 28.95 | 3.2 |

| **Element** | Ga | Ge | Hf | Hg | In | K | La | Li |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.1 | 0.1 | 0.02 | 5 | 0.02 | 0.01 | 0.5 | 0.1 |
| **Samples** | ppm | ppm | ppm | ppb | ppm | % | ppm | ppm |
| **300** | 3.6 | | | 169 | | 0.31 | 5.1 | |
| **302** | 3.1 | | | 177 | | 0.28 | 3.9 | |
| **303** | 3.4 | | | 154 | | 0.27 | 4.8 | |
| **307** | 3.1 | | | 365 | | 0.28 | 4.5 | |
| **308** | 3.2 | | | 270 | | 0.27 | 4.7 | |
| **309** | 3.2 | | | 203 | | 0.25 | 3.8 | |
| **310** | 3.5 | | | 375 | | 0.27 | 3.9 | |
| **311** | 1.7 | | | 90 | | 0.12 | 6.9 | |
| **312** | 3.6 | | | 203 | | 0.26 | 3.8 | |
| **313** | 3.4 | | | 341 | | 0.25 | 3.7 | |
| **314** | 3.7 | | | 181 | | 0.26 | 3.9 | |
| **315** | 3.5 | | | 196 | | 0.26 | 3.6 | |
| **316** | 4 | <.1 | 0.07 | 142 | 0.05 | 0.38 | 5 | 19.5 |
| **317** | 3.3 | | | 107 | | 0.28 | 5.3 | |
| **318** | 3 | | | 149 | | 0.3 | 4.7 | |
| **319** | 3.1 | | | 133 | | 0.28 | 4.8 | |
| **320** | 3.8 | <.1 | 0.08 | 98 | 0.04 | 0.36 | 5.5 | 19.3 |
| **321** | 2.8 | | | 134 | | 0.27 | 4.7 | |
| **322** | 2.8 | | | 145 | | 0.27 | 4.3 | |
| **323** | 2.9 | | | 207 | | 0.28 | 4.5 | |
| **324** | 2.6 | | | 140 | | 0.22 | 5.4 | |
| **325** | 3.2 | <.1 | 0.05 | 123 | 0.05 | 0.3 | 5.3 | 10.3 |
| **326** | 2.7 | | | 125 | | 0.26 | 5 | |
| **327** | 2.9 | | | 123 | | 0.25 | 4.9 | |
| **328** | 2.4 | | | 104 | | 0.23 | 4.8 | |
| **329** | 3.3 | <.1 | 0.07 | 112 | 0.04 | 0.35 | 5.1 | 11.6 |
| **330** | 2.8 | | | 266 | | 0.23 | 5.7 | |
| **332** | 2.7 | | | 99 | | 0.24 | 5.2 | |
| **333** | 2.7 | | | 158 | | 0.23 | 4.6 | |
| **334** | 2.9 | <.1 | 0.06 | 126 | 0.03 | 0.28 | 6.2 | 8.4 |
| **335** | 2.6 | | | 165 | | 0.22 | 5.6 | |
| **336** | 2 | | | 66 | | 0.19 | 4.5 | |
| **338** | 2.4 | | | 125 | | 0.19 | 4.1 | |
| **339** | 3 | <.1 | 0.05 | 102 | 0.05 | 0.32 | 4.8 | 10.9 |
| **340** | 2.4 | | | 78 | | 0.24 | 4.3 | |
| **341** | 2.6 | | | 69 | | 0.27 | 4.2 | |
| **342** | 3.4 | <.1 | 0.08 | 115 | 0.04 | 0.33 | 5.6 | 11.2 |
| **343** | 2.4 | | | 120 | | 0.22 | 4 | |
| **344** | 2.6 | | | 85 | | 0.23 | 4 | |
| **345** | 2.6 | | | 111 | | 0.21 | 4.7 | |
| **346** | 2.6 | | | 111 | | 0.21 | 4.1 | |
| **347** | 2.1 | | | 144 | | 0.16 | 3.5 | |
| **348** | 3.9 | <.1 | 0.06 | 178 | 0.04 | 0.27 | 5.8 | 10 |
| **349** | 2.8 | | | 130 | | 0.25 | 4.4 | |
| **350** | 2.5 | | | 115 | | 0.21 | 4.6 | |
| **351** | 3.3 | <.1 | 0.07 | 107 | 0.05 | 0.32 | 5.6 | 9.3 |
| **352** | 2.8 | | | 99 | | 0.24 | 4.4 | |
| **353** | 4.1 | | | 143 | | 0.27 | 4.5 | |
| **354** | 3.8 | <.1 | 0.09 | 86 | 0.05 | 0.34 | 4.3 | 23.2 |
| **355** | 3.2 | | | 107 | | 0.25 | 3.3 | |

| **Element** | Mg | Mn | Mo | Na | Nb | Ni | P | Pb |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.01 | 1 | 0.01 | 0.001 | 0.02 | 0.1 | 0.001 | 0.01 |
| **Samples** | % | ppm | ppm | % | ppm | ppm | % | ppm |
| **300** | 0.55 | 178 | 28.9 | 0.251 |  | 80.8 | 0.06 | 23.36 |
| **302** | 0.3 | 103 | 17.8 | 0.254 |  | 67.5 | 0.06 | 19.81 |
| **303** | 0.46 | 153 | 14.54 | 0.231 |  | 51.7 | 0.059 | 21.98 |
| **307** | 0.28 | 104 | 12.55 | 0.214 |  | 61.3 | 0.068 | 20.52 |
| **308** | 0.32 | 130 | 23.6 | 0.204 |  | 82.9 | 0.061 | 22.1 |
| **309** | 0.32 | 122 | 21.11 | 0.237 |  | 75.4 | 0.057 | 22.73 |
| **310** | 0.34 | 142 | 16.99 | 0.231 |  | 65.2 | 0.062 | 22.4 |
| **311** | 3.25 | 2193 | 13.95 | 0.098 |  | 33.5 | 0.034 | 10.74 |
| **312** | 0.38 | 173 | 18.36 | 0.244 |  | 69.7 | 0.063 | 24.09 |
| **313** | 0.39 | 160 | 13.76 | 0.211 |  | 63 | 0.063 | 21.41 |
| **314** | 0.45 | 130 | 15.09 | 0.232 |  | 64.6 | 0.064 | 20.71 |
| **315** | 0.42 | 166 | 12.12 | 0.224 |  | 65 | 0.06 | 20.75 |
| **316** | 0.46 | 119 | 16.78 | 0.233 | 0.04 | 56.6 | 0.066 | 16.71 |
| **317** | 0.53 | 96 | 15.75 | 0.205 |  | 43.9 | 0.07 | 14.95 |
| **318** | 0.43 | 76 | 11.87 | 0.22 |  | 47.3 | 0.067 | 12.6 |
| **319** | 0.53 | 89 | 14.28 | 0.215 |  | 51 | 0.062 | 13.99 |
| **320** | 0.45 | 74 | 9.72 | 0.236 | 0.04 | 56.7 | 0.067 | 15.51 |
| **321** | 0.49 | 74 | 14.17 | 0.201 |  | 53.7 | 0.065 | 13.51 |
| **322** | 0.45 | 79 | 11.3 | 0.204 |  | 50.8 | 0.058 | 13.31 |
| **323** | 0.53 | 81 | 13.29 | 0.194 |  | 59.2 | 0.062 | 14.91 |
| **324** | 0.47 | 82 | 14.23 | 0.188 |  | 49.8 | 0.078 | 11.06 |
| **325** | 0.48 | 87 | 16.28 | 0.194 | 0.04 | 59.4 | 0.071 | 15.57 |
| **326** | 0.47 | 65 | 13.66 | 0.183 |  | 49.3 | 0.064 | 13.78 |
| **327** | 0.54 | 102 | 19.89 | 0.199 |  | 46.9 | 0.06 | 14.32 |
| **328** | 0.51 | 67 | 13.3 | 0.188 |  | 55.6 | 0.063 | 14.79 |
| **329** | 0.59 | 84 | 14.23 | 0.214 | 0.07 | 49.6 | 0.073 | 25.94 |
| **330** | 0.58 | 105 | 24.71 | 0.171 |  | 53.4 | 0.068 | 15.26 |
| **332** | 0.51 | 75 | 17.83 | 0.185 |  | 64.6 | 0.063 | 15.08 |
| **333** | 0.46 | 79 | 26.35 | 0.182 |  | 66.6 | 0.065 | 15.79 |
| **334** | 0.93 | 127 | 18.57 | 0.176 | 0.07 | 45.6 | 0.073 | 13.65 |
| **335** | 0.61 | 85 | 18.81 | 0.161 |  | 51.3 | 0.072 | 12.88 |
| **336** | 1.04 | 106 | 6.88 | 0.153 |  | 32.5 | 0.057 | 9.93 |
| **338** | 0.55 | 114 | 36.25 | 0.18 |  | 53.8 | 0.072 | 12.59 |
| **339** | 0.52 | 59 | 8.82 | 0.209 | 0.03 | 52.2 | 0.07 | 14.98 |
| **340** | 0.52 | 64 | 6.49 | 0.207 |  | 42.7 | 0.061 | 12.85 |
| **341** | 0.47 | 68 | 5.52 | 0.219 |  | 40.5 | 0.056 | 12.59 |
| **342** | 0.55 | 105 | 19.63 | 0.207 | 0.06 | 49 | 0.077 | 13.9 |
| **343** | 0.49 | 73 | 10.25 | 0.194 |  | 51.5 | 0.058 | 12.67 |
| **344** | 0.52 | 77 | 16.82 | 0.199 |  | 59.5 | 0.06 | 12.93 |
| **345** | 0.54 | 97 | 18.43 | 0.172 |  | 54.7 | 0.066 | 11.66 |
| **346** | 0.51 | 71 | 25.63 | 0.183 |  | 82.7 | 0.063 | 12.47 |
| **347** | 0.47 | 107 | 114.36 | 0.135 |  | 48.9 | 0.06 | 10.9 |
| **348** | 0.52 | 101 | 27.58 | 0.182 | 0.06 | 58.8 | 0.066 | 13.89 |
| **349** | 0.64 | 96 | 4.48 | 0.213 |  | 37.1 | 0.071 | 15.24 |
| **350** | 0.55 | 97 | 4.63 | 0.179 |  | 39.1 | 0.066 | 13.69 |
| **351** | 0.53 | 83 | 10.26 | 0.208 | 0.04 | 58 | 0.079 | 16.67 |
| **352** | 0.7 | 122 | 7.87 | 0.189 |  | 42.4 | 0.068 | 12.87 |
| **353** | 0.59 | 106 | 9.97 | 0.238 |  | 51.4 | 0.062 | 14.63 |
| **354** | 0.55 | 104 | 5.25 | 0.255 | 0.03 | 42.6 | 0.064 | 16.74 |
| **355** | 0.45 | 91 | 3.34 | 0.253 |  | 43.9 | 0.052 | 15.99 |

| Element | Pd | Pt | Rb | Re | S | Sb | Sc | Se |
|---|---|---|---|---|---|---|---|---|
| LDL | 10 | 2 | 0.1 | 1 | 0.02 | 0.02 | 0.1 | 0.1 |
| Samples | ppb | ppb | ppm | ppb | % | ppm | ppm | ppm |
| 300 | | | | | 2.34 | 1.66 | 5.4 | 5.5 |
| 302 | | | | | 1.75 | 1.43 | 3.3 | 3.5 |
| 303 | | | | | 1.94 | 1.4 | 5.3 | 2.6 |
| 307 | | | | | 1.98 | 1.12 | 3.3 | 4.2 |
| 308 | | | | | 2.92 | 1.73 | 3.9 | 6.7 |
| 309 | | | | | 3.16 | 1.63 | 3.7 | 5.8 |
| 310 | | | | | 2.35 | 1.4 | 3.9 | 4.2 |
| 311 | | | | | 1.1 | 0.82 | 11.5 | 2.1 |
| 312 | | | | | 2.41 | 1.34 | 4.3 | 3.9 |
| 313 | | | | | 2.12 | 1.42 | 4.3 | 3.2 |
| 314 | | | | | 2.19 | 1.5 | 4.6 | 3.1 |
| 315 | | | | | 2.13 | 1.39 | 4.8 | 3 |
| 316 | < 10 | < 2 | 23.2 | 21 | 1.85 | 1.06 | 5.2 | 2.8 |
| 317 | | | | | 1.86 | 0.8 | 6 | 2.2 |
| 318 | | | | | 1.45 | 0.99 | 5.1 | 2.2 |
| 319 | | | | | 1.77 | 0.81 | 5.5 | 2.4 |
| 320 | < 10 | < 2 | 21.7 | 22 | 1.44 | 0.95 | 6.6 | 3 |
| 321 | | | | | 1.77 | 0.98 | 5.2 | 2.6 |
| 322 | | | | | 1.52 | 0.97 | 4.2 | 2.4 |
| 323 | | | | | 1.93 | 1.21 | 4.9 | 3.6 |
| 324 | | | | | 1.36 | 0.91 | 6 | 2.6 |
| 325 | < 10 | < 2 | 18.8 | 36 | 1.91 | 1.11 | 5.5 | 3.5 |
| 326 | | | | | 1.84 | 1.29 | 4.7 | 3 |
| 327 | | | | | 2.05 | 1.08 | 4.6 | 3.1 |
| 328 | | | | | 1.79 | 1.36 | 4.3 | 3.6 |
| 329 | < 10 | < 2 | 19.8 | 23 | 1.86 | 1.02 | 4.6 | 3 |
| 330 | | | | | 2.12 | 1 | 5 | 3.5 |
| 332 | | | | | 1.8 | 1.37 | 5.1 | 4.3 |
| 333 | | | | | 2.61 | 1.47 | 4.1 | 4.4 |
| 334 | < 10 | < 2 | 16.1 | 28 | 1.97 | 1.09 | 4.8 | 3.4 |
| 335 | | | | | 1.83 | 1.32 | 4.4 | 3 |
| 336 | | | | | 1.5 | 0.78 | 3.5 | 2.1 |
| 338 | | | | | 3.22 | 2.29 | 2.8 | 5.9 |
| 339 | < 10 | < 2 | 19.3 | 29 | 1.5 | 0.73 | 4.5 | 2.9 |
| 340 | | | | | 1.49 | 0.91 | 3.5 | 3 |
| 341 | | | | | 1.32 | 0.82 | 3.6 | 2.5 |
| 342 | < 10 | < 2 | 19.4 | 32 | 2.04 | 1.09 | 4.8 | 3.4 |
| 343 | | | | | 1.92 | 1.15 | 4.3 | 3.3 |
| 344 | | | | | 2.24 | 1.3 | 4.1 | 3.3 |
| 345 | | | | | 2.15 | 1.16 | 4.8 | 2.9 |
| 346 | | | | | 2.16 | 1.9 | 3.6 | 5.4 |
| 347 | | | | | 16.63 | 4.88 | 2.4 | 14.2 |
| 348 | < 10 | < 2 | 16.3 | 46 | 2.42 | 1.82 | 4.9 | 4.5 |
| 349 | | | | | 2.96 | 1.08 | 3.5 | 2.4 |
| 350 | | | | | 2.48 | 1.04 | 4.3 | 2.3 |
| 351 | < 10 | < 2 | 19.5 | 19 | 2.69 | 1.32 | 4.4 | 4.4 |
| 352 | | | | | 2.5 | 0.95 | 4.6 | 3 |
| 353 | | | | | 2.68 | 0.8 | 4.1 | 4.8 |
| 354 | < 10 | < 2 | 22.7 | 10 | 2 | 0.57 | 4.7 | 2.2 |
| 355 | | | | | 2.48 | 0.53 | 4.2 | 1.9 |

| Element | Sn | Sr | Ta | Te | Th | Ti | Tl | U |
|---|---|---|---|---|---|---|---|---|
| LDL | 0.1 | 0.5 | 0.05 | 0.02 | 0.1 | 0.001 | 0.02 | 0.1 |
| Samples | ppm | ppm | ppm | ppm | ppm | % | ppm | ppm |
| **300** |  | 110.7 |  | 0.12 | 7 | 0.01 | 0.31 | 3.6 |
| **302** |  | 83.6 |  | 0.07 | 6.3 | 0.004 | 0.4 | 2.13 |
| **303** |  | 103.7 |  | 0.09 | 7.2 | 0.013 | 0.54 | 2.27 |
| **307** |  | 81.5 |  | 0.1 | 5.7 | 0.001 | 0.53 | 3.15 |
| **308** |  | 76.6 |  | 0.15 | 6 | 0.004 | 0.53 | 3.66 |
| **309** |  | 77.8 |  | 0.18 | 5.9 | 0.009 | 0.52 | 3.62 |
| **310** |  | 78.8 |  | 0.14 | 6.3 | < .001 | 0.4 | 2.97 |
| **311** |  | 87.3 |  | 0.08 | 3.4 | 0.001 | 0.41 | 4.21 |
| **312** |  | 83.5 |  | 0.09 | 7 | 0.004 | 0.44 | 2.84 |
| **313** |  | 74.1 |  | 0.12 | 5.7 | < .001 | 0.38 | 2.42 |
| **314** |  | 99.2 |  | 0.1 | 6.1 | 0.005 | 0.36 | 2.6 |
| **315** |  | 80.9 |  | 0.11 | 5.8 | 0.005 | 0.36 | 2.33 |
| **316** | 0.7 | 84.2 | < .05 | 0.09 | 4.9 | 0.007 | 0.22 | 3.13 |
| **317** |  | 106.9 |  | 0.05 | 5.1 | < .001 | 0.16 | 3.61 |
| **318** |  | 107.4 |  | 0.06 | 4.3 | < .001 | 0.19 | 3.05 |
| **319** |  | 119.3 |  | 0.06 | 4.6 | < .001 | 0.21 | 2.93 |
| **320** | 0.8 | 111.6 | < .05 | 0.1 | 5.4 | < .001 | 0.29 | 2.97 |
| **321** |  | 145.7 |  | 0.09 | 4.6 | 0.006 | 0.26 | 3.16 |
| **322** |  | 155.6 |  | 0.09 | 4.5 | < .001 | 0.26 | 2.36 |
| **323** |  | 110.8 |  | 0.09 | 4.7 | < .001 | 0.37 | 2.65 |
| **324** |  | 395.7 |  | 0.06 | 3.5 | 0.002 | 0.23 | 7.17 |
| **325** | 0.6 | 223.5 | < .05 | 0.08 | 4.7 | 0.01 | 0.22 | 3.75 |
| **326** |  | 184.1 |  | 0.11 | 4.3 | < .001 | 0.25 | 2.92 |
| **327** |  | 149.4 |  | 0.06 | 4.5 | < .001 | 0.18 | 3.67 |
| **328** |  | 124.8 |  | 0.09 | 4.7 | 0.002 | 0.39 | 2.63 |
| **329** | 0.6 | 196.4 | < .05 | 0.09 | 4.7 | 0.001 | 0.21 | 3.51 |
| **330** |  | 141.5 |  | 0.08 | 4.5 | < .001 | 0.19 | 5.58 |
| **332** |  | 133 |  | 0.1 | 4.6 | 0.002 | 0.37 | 3.27 |
| **333** |  | 106 |  | 0.09 | 4.4 | 0.007 | 0.3 | 3.82 |
| **334** | 0.4 | 294.5 | < .05 | 0.08 | 4.1 | 0.003 | 0.17 | 5.24 |
| **335** |  | 204.4 |  | 0.06 | 4.3 | < .001 | 0.29 | 5.15 |
| **336** |  | 221.6 |  | 0.07 | 3.5 | < .001 | 0.17 | 2.65 |
| **338** |  | 162.6 |  | 0.11 | 4.1 | < .001 | 0.69 | 2.89 |
| **339** | 0.6 | 120.5 | < .05 | 0.09 | 4.9 | 0.002 | 0.27 | 2.36 |
| **340** |  | 108.4 |  | 0.05 | 4.9 | < .001 | 0.24 | 1.87 |
| **341** |  | 94.2 |  | 0.05 | 4.9 | < .001 | 0.21 | 1.62 |
| **342** | 0.6 | 144.8 | < .05 | 0.08 | 4.7 | 0.002 | 0.16 | 4.17 |
| **343** |  | 124.6 |  | 0.09 | 4.5 | < .001 | 0.45 | 2.24 |
| **344** |  | 138.9 |  | 0.06 | 4.4 | < .001 | 0.37 | 2.93 |
| **345** |  | 193.5 |  | 0.07 | 4.3 | 0.005 | 0.25 | 4.41 |
| **346** |  | 135.1 |  | 0.12 | 3.7 | < .001 | 0.55 | 4.78 |
| **347** |  | 100.3 |  | 0.11 | 3.6 | < .001 | 0.39 | 2.76 |
| **348** | 0.6 | 157.2 | < .05 | 0.13 | 4.8 | 0.008 | 0.24 | 6.22 |
| **349** |  | 90.2 |  | 0.09 | 5.2 | < .001 | 0.12 | 1.9 |
| **350** |  | 136.2 |  | 0.11 | 4.4 | < .001 | 0.17 | 2.35 |
| **351** | 0.5 | 118.8 | < .05 | 0.2 | 5 | 0.003 | 0.23 | 2.97 |
| **352** |  | 117.7 |  | 0.1 | 3.8 | < .001 | 0.16 | 2.86 |
| **353** |  | 58.1 |  | 0.15 | 5.1 | 0.002 | 0.24 | 2.8 |
| **354** | 0.6 | 62.9 | < .05 | 0.11 | 4.8 | 0.004 | 0.15 | 1.96 |
| **355** |  | 60.4 |  | 0.12 | 5.2 | < .001 | 0.2 | 1.19 |

***Analysis: GROUP 1EX - 0.25 GM***

| **Element** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ag** | **Al** | **As** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.1** | **0.01** | **0.1** | **0.1** | **0.1** | **0.01** | **1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** |
| **300** | 75 | < .1 | | 896.9 | | 0.6 | 8.3 | 27 |
| **302** | 37 | < .1 | | 157.4 | | | | |
| **303** | 39 | < .1 | | 132 | | | | |
| **307** | 43 | < .1 | | 162.3 | | | | |
| **308** | 53 | < .1 | | 175.4 | | | | |
| **309** | 46 | < .1 | | 188.1 | | | | |
| **310** | 41 | < .1 | | 165.9 | | | | |
| **311** | 94 | < .1 | | 82.8 | | | | |
| **312** | 42 | < .1 | | 136.6 | | | | |
| **313** | 43 | < .1 | | 156 | | | | |
| **314** | 41 | < .1 | | 201.4 | | | | |
| **315** | 42 | < .1 | | 158.2 | | | | |
| **316** | 55 | 0.1 | 10.58 | 176.1 | 2.6 | 0.3 | 7.5 | 17 |
| **317** | 36 | < .1 | | 119.5 | | | | |
| **318** | 46 | < .1 | | 208.6 | | | | |
| **319** | 38 | < .1 | | 113.2 | | | | |
| **320** | 54 | < .1 | 11.68 | 165.3 | 2.6 | 0.3 | 7.64 | 13 |
| **321** | 40 | < .1 | | 159.6 | | | | |
| **322** | 42 | < .1 | | 232.1 | | | | |
| **323** | 46 | < .1 | | 162.7 | | | | |
| **324** | 42 | < .1 | | 233.3 | | | | |
| **325** | 49 | < .1 | 12.02 | 152.7 | 2 | 0.4 | 6.38 | 12 |
| **326** | 48 | < .1 | | 124.5 | | | | |
| **327** | 38 | < .1 | | 135.5 | | | | |
| **328** | 54 | < .1 | | 139 | | | | |
| **329** | 47 | < .1 | 10.7 | 144.8 | 2.1 | 0.4 | 6.77 | 14 |
| **330** | 38 | < .1 | | 162.6 | | | | |
| **332** | 52 | < .1 | | 141.4 | | | | |
| **333** | 45 | < .1 | | 144.6 | | | | |
| **334** | 64 | < .1 | 11.79 | 119.2 | 2.1 | 0.4 | 5.13 | 12 |
| **335** | 47 | < .1 | | 145.7 | | | | |
| **336** | 40 | < .1 | | 117.7 | | | | |
| **338** | 57 | < .1 | | 131.2 | | | | |
| **339** | 51 | < .1 | 10.28 | 135.5 | 1.7 | 0.3 | 7.1 | 12 |
| **340** | 48 | < .1 | | 232.4 | | | | |
| **341** | 49 | < .1 | | 131.8 | | | | |
| **342** | 47 | < .1 | 11.82 | 154.9 | 2.1 | 0.3 | 6.76 | 16 |
| **343** | 49 | < .1 | | 163.1 | | | | |
| **344** | 45 | < .1 | | 133.5 | | | | |
| **345** | 49 | < .1 | | 133 | | | | |
| **346** | 80 | < .1 | | 170.1 | | | | |
| **347** | 52 | < .1 | | 95.8 | | | | |
| **348** | 70 | < .1 | 11.31 | 144.9 | 2.2 | 0.4 | 6.38 | 15 |
| **349** | 32 | < .1 | | 172.6 | | | | |
| **350** | 32 | < .1 | | 113.2 | | | | |
| **351** | 44 | < .1 | 11.9 | 216.4 | 2 | 0.4 | 6.53 | 12 |
| **352** | 40 | < .1 | | 133.6 | | | | |
| **353** | 29 | < .1 | | 135.1 | | | | |
| **354** | 35 | < .1 | 10.15 | 122.7 | 2.1 | 0.2 | 7.59 | 15 |
| **355** | 28 | < .1 | | 185.6 | | | | |

| **Element** | Au | Ba | Be | Bi | Ca | Cd | Ce | Co |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.1 | 1 | 1 | 0.1 | 0.01 | 0.1 | 1 | 1 |
| **Samples** | ppm | ppm | ppm | ppm | % | ppm | ppm | ppm |
| **300** | <.1 | 148 | 2 | 0.6 | 1.06 | 7.4 | 73 | 21 |
| **316** | <.1 | 102 | 1 | 0.2 | 2.49 | 0.6 | 55 | 13 |
| **320** | <.1 | 180 | 2 | 0.2 | 3.71 | 1.3 | 60 | 13 |
| **325** | <.1 | 100 | 1 | 0.2 | 6.5 | 1.2 | 56 | 13 |
| **329** | <.1 | 104 | 4 | 0.2 | 5.45 | 1 | 58 | 13 |
| **334** | <.1 | 101 | 1 | 0.1 | 10.64 | 1 | 46 | 13 |
| **339** | <.1 | 142 | 1 | 0.3 | 4.74 | 1.2 | 63 | 12 |
| **342** | <.1 | 102 | 1 | 0.2 | 5.65 | 0.8 | 56 | 14 |
| **348** | <.1 | 112 | 1 | 0.3 | 6.77 | 1.2 | 56 | 15 |
| **351** | <.1 | 98 | 1 | 0.3 | 5.03 | 1.6 | 56 | 17 |
| **354** | <.1 | 138 | 3 | 0.3 | 0.86 | 0.4 | 58 | 13 |

| **Element** | Cr | Cu | Fe | Hf | K | La | Li | Mg |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.1 | 0.1 | 0.01 | 0.1 | 0.01 | 0.1 | 0.1 | 0.01 |
| **Samples** | ppm | ppm | % | ppm | % | ppm | ppm | % |
| **300** | 115.3 | 71.5 | 5.07 | 3 | 2.2 | 40.7 | 87.7 | 0.97 |
| **316** | 114.9 | 50.3 | 3.78 | 2 | 2.2 | 23.6 | 69.2 | 0.84 |
| **320** | 115.9 | 37.9 | 3.26 | 2.3 | 2.11 | 26.5 | 72.5 | 0.85 |
| **325** | 102.8 | 38.4 | 3.21 | 1.7 | 1.83 | 26.9 | 49 | 0.82 |
| **329** | 103.3 | 36.4 | 3.28 | 2.1 | 2.04 | 27 | 47.8 | 0.95 |
| **334** | 80.3 | 33.1 | 3.31 | 1.4 | 1.46 | 20.2 | 34.5 | 1.23 |
| **339** | 108.3 | 35.7 | 2.72 | 2.2 | 2.1 | 27.8 | 56.7 | 0.91 |
| **342** | 99.6 | 37.6 | 3.38 | 2.1 | 1.94 | 26.2 | 52.8 | 0.9 |
| **348** | 83.2 | 36.8 | 3.57 | 1.9 | 1.63 | 25.6 | 47.6 | 0.83 |
| **351** | 85.4 | 47.2 | 3.78 | 1.6 | 1.87 | 31.8 | 43.1 | 0.86 |
| **354** | 106.4 | 33.5 | 3.82 | 2.3 | 2.23 | 30.1 | 79.5 | 0.94 |

| **Element** | Mn | Mo | Na | Nb | Ni | P | Pb | Rb |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 1 | 0.1 | 0.001 | 0.1 | 0.1 | 0.001 | 0.1 | 0.1 |
| **Samples** | ppm | ppm | % | ppm | ppm | % | ppm | ppm |
| **300** | 202 | 32.5 | 0.527 | 14 | 82.3 | 0.084 | 26.5 | 126.5 |
| **316** | 153 | 16.1 | 0.418 | 11.9 | 58.2 | 0.077 | 18.4 | 103 |
| **320** | 101 | 10 | 0.451 | 11.4 | 64 | 0.079 | 18.5 | 106.8 |
| **325** | 102 | 14.9 | 0.371 | 11.4 | 54.7 | 0.078 | 17.1 | 111.7 |
| **329** | 109 | 14.4 | 0.426 | 11.2 | 52.5 | 0.082 | 26.7 | 121.7 |
| **334** | 147 | 18 | 0.308 | 8.9 | 48.6 | 0.074 | 14.1 | 86.4 |
| **339** | 84 | 8.8 | 0.4 | 11.9 | 57.3 | 0.081 | 17.2 | 118.5 |
| **342** | 126 | 18.9 | 0.373 | 11.4 | 51.7 | 0.087 | 15.9 | 116.6 |
| **348** | 114 | 26.6 | 0.328 | 9.5 | 60.1 | 0.072 | 15.5 | 98.3 |
| **351** | 106 | 9.4 | 0.358 | 9.8 | 49.9 | 0.085 | 17.1 | 101.4 |
| **354** | 129 | 5.3 | 0.442 | 12.7 | 42.2 | 0.076 | 17.4 | 108.3 |

| **Element** | S | Sb | Sc | Sn | Sr | Ta | Th | Ti |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.1 | 0.1 | 1 | 0.1 | 1 | 0.1 | 0.1 | 0.01 |
| **Samples** | % | ppm | ppm | ppm | ppm | ppm | ppm | % |
| **300** | 2.9 | 3.4 | 15 | 3.4 | 213 | 1 | 12.5 | 0.432 |
| **316** | 2.1 | 2 | 11 | 1.9 | 170 | 0.8 | 8.4 | 0.398 |
| **320** | 1.6 | 1.9 | 13 | 2.3 | 204 | 0.8 | 9.1 | 0.392 |
| **325** | 2.3 | 2.3 | 10 | 1.9 | 305 | 0.7 | 8 | 0.341 |
| **329** | 2.2 | 2 | 10 | 1.9 | 275 | 0.7 | 8 | 0.352 |
| **334** | 2.3 | 2.1 | 8 | 1.4 | 337 | 0.5 | 6.7 | 0.276 |
| **339** | 1.8 | 1.5 | 11 | 1.9 | 214 | 0.8 | 8.9 | 0.371 |
| **342** | 2.4 | 2 | 9 | 1.8 | 224 | 0.7 | 8 | 0.356 |
| **348** | 2.9 | 3.1 | 9 | 1.6 | 227 | 0.6 | 7.9 | 0.294 |
| **351** | 3.1 | 2.2 | 9 | 1.6 | 220 | 0.6 | 8.2 | 0.33 |
| **354** | 2.2 | 1 | 10 | 2.2 | 170 | 0.8 | 8.2 | 0.417 |

***Analysis: GROUP 4B - REE - 0.200 GM***

| **Element** | **U** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ce** | **Co** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **1** | **0.1** | **0.1** | **1** | **0.1** | **0.5** | **0.5** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **300** | 9.8 | 411 | 1.7 | 23.5 | 911 | 84.4 | 82.4 | 19.1 |
| **316** | 5.1 | 276 | 1.1 | 15.8 | 190 | 62.4 | 75.9 | 14.5 |
| **320** | 5.2 | 282 | 1 | 18 | 184 | 60.7 | 76 | 14.3 |
| **325** | 5.6 | 242 | 1 | 18.6 | 168 | 58.5 | 67.1 | 13 |
| **329** | 5.6 | 229 | 0.9 | 17.6 | 161 | 59.5 | 62.7 | 12.4 |
| **334** | 6.6 | 216 | 1 | 16.8 | 132 | 45.6 | 53.5 | 11.5 |
| **339** | 4.8 | 281 | 0.8 | 17.9 | 162 | 62.1 | 69 | 12.7 |
| **342** | 6.1 | 232 | 1.1 | 18.4 | 169 | 61.4 | 64.8 | 14.2 |
| **348** | 8.9 | 307 | 0.8 | 17.3 | 160 | 54.9 | 61.9 | 13.4 |
| **351** | 4.7 | 235 | 1 | 14.5 | 227 | 55.5 | 61.5 | 17.5 |
| **354** | 4.4 | 229 | 1.2 | 13.8 | 134 | 68.2 | 77.2 | 13.7 |

| **Element** | Cs | Dy | Er | Eu | Ga | Gd | Hf | Ho |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.1 | 0.05 | 0.05 | 0.05 | 0.5 | 0.05 | 0.5 | 0.05 |
| **Samples** | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm |
| **300** | 10.3 | 4.69 | 3.09 | 1.28 | 23 | 4.79 | 4 | 1.02 |
| **316** | 8.8 | 4.29 | 2.5 | 1.26 | 20.2 | 5.29 | 3.5 | 0.91 |
| **320** | 9 | 4.56 | 2.59 | 1.43 | 19.8 | 4.85 | 3.7 | 0.97 |
| **325** | 7.2 | 4.09 | 2.42 | 1.15 | 16.7 | 4.1 | 3.2 | 0.85 |
| **329** | 7.5 | 3.53 | 2.05 | 1.07 | 16.9 | 4.19 | 3.4 | 0.73 |
| **334** | 5.3 | 3.25 | 1.94 | 1.05 | 13.4 | 3.84 | 2.7 | 0.68 |
| **339** | 7.6 | 3.71 | 2.13 | 1.25 | 17.9 | 4.16 | 4 | 0.77 |
| **342** | 6.9 | 3.62 | 2.17 | 1.12 | 16.9 | 4.47 | 3.3 | 0.73 |
| **348** | 5.9 | 3.9 | 1.94 | 1.1 | 16.5 | 3.71 | 3.2 | 0.79 |
| **351** | 8.2 | 3.57 | 2.02 | 0.98 | 16.7 | 4.6 | 3 | 0.77 |
| **354** | 10.3 | 4.32 | 2.54 | 1.12 | 22.7 | 5.07 | 4 | 0.9 |

| **Element** | La | Lu | Nb | Nd | Pr | Sn | Rb | Sm |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.5 | 0.01 | 0.5 | 0.4 | 0.02 | 1 | 0.5 | 0.1 |
| **Samples** | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm |
| **300** | 41 | 0.48 | 17 | 32.5 | 9.22 | 1 | 133 | 6 |
| **316** | 37.4 | 0.37 | 17.2 | 36.6 | 9.21 | 1 | 142.7 | 6.3 |
| **320** | 37.7 | 0.38 | 16.8 | 36.8 | 9.15 | 1 | 138.2 | 6.3 |
| **325** | 33.4 | 0.32 | 15.1 | 30.4 | 8.06 | < 1 | 118.5 | 5.6 |
| **329** | 33 | 0.33 | 15.5 | 29.5 | 7.55 | 1 | 120.4 | 5.2 |
| **334** | 27 | 0.27 | 12 | 24.9 | 6.54 | < 1 | 86 | 4.4 |
| **339** | 35.7 | 0.31 | 15.7 | 31 | 8.4 | < 1 | 129.3 | 5.6 |
| **342** | 33.8 | 0.32 | 14.9 | 28.8 | 7.81 | < 1 | 117.2 | 5 |
| **348** | 30.1 | 0.3 | 12.5 | 30.5 | 7.54 | < 1 | 100.9 | 5.2 |
| **351** | 32.9 | 0.34 | 13.4 | 29.5 | 7.53 | < 1 | 117.7 | 5.6 |
| **354** | 41.1 | 0.42 | 17.2 | 35.3 | 9.38 | 2 | 147.9 | 6.4 |

| **Element** | Sr | Ta | Tb | Th | Tm | U | V | W |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.5 | 0.1 | 0.01 | 0.1 | 0.05 | 0.1 | 5 | 0.1 |
| **Samples** | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm |
| **300** | 255.4 | 1.1 | 0.83 | 14.9 | 0.49 | 10.5 | 389 | 2.2 |
| **316** | 201.8 | 1.1 | 0.8 | 11.7 | 0.42 | 6.9 | 280 | 3.5 |
| **320** | 227.4 | 0.9 | 0.86 | 10.7 | 0.44 | 6.9 | 284 | 1.7 |
| **325** | 353 | 0.9 | 0.77 | 10.5 | 0.39 | 7.1 | 263 | 1.3 |
| **329** | 300.1 | 0.8 | 0.68 | 9.2 | 0.34 | 7 | 231 | 1.3 |
| **334** | 383.5 | 0.7 | 0.63 | 8.3 | 0.32 | 8.1 | 205 | 0.9 |
| **339** | 228.2 | 0.9 | 0.73 | 10.7 | 0.36 | 5.7 | 293 | 1.2 |
| **342** | 252.3 | 0.9 | 0.78 | 9.3 | 0.36 | 7.8 | 235 | 1.2 |
| **348** | 262.9 | 0.9 | 0.71 | 9.3 | 0.3 | 10.7 | 320 | 1.4 |
| **351** | 214.9 | 0.8 | 0.63 | 10.1 | 0.33 | 5.9 | 248 | 1.2 |
| **354** | 193.2 | 1.1 | 0.77 | 12.8 | 0.41 | 6.3 | 245 | 1.5 |

***Analysis: GROUP 4A - 0.200 GM***

| **Element** | **Y** | **Yb** | **Zr** | **Al2O3** | **Ba** | **CaO** | **Cr2O3** | **Cr2O3** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.05** | **0.5** | **0.03** | **5** | **0.01** | **0.001** | **0.001** |
| **Samples** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **%** | **%** | **%** |
| **300** | 31 | 3.07 | 141.5 | 16.59 | 998 | 1.56 | 0.012 | |
| **316** | 25.9 | 2.41 | 120.2 | 15.33 | 1226 | 3.78 | 0.013 | 0.0154 |
| **320** | 27 | 2.85 | 122 | 15.06 | 1063 | 5.76 | 0.012 | 0.015 |
| **325** | 24.7 | 2.5 | 114.5 | 12.95 | 1069 | 10.37 | 0.013 | 0.0135 |
| **329** | 21.7 | 2.25 | 107.5 | 13.34 | 917 | 8.47 | 0.014 | 0.0134 |
| **334** | 20.4 | 2.03 | 92.5 | 10.37 | 1036 | 17.25 | 0.009 | 0.0102 |
| **339** | 22.8 | 2.16 | 118.9 | 14.09 | 934 | 7.3 | 0.011 | 0.0146 |
| **342** | 22.9 | 2.32 | 105.9 | 13.8 | 911 | 8.93 | 0.013 | 0.0129 |
| **348** | 21.9 | 2.07 | 102.6 | 13.3 | 826 | 11.06 | 0.009 | 0.0111 |
| **351** | 23.3 | 2.13 | 102.5 | 13.48 | 829 | 8.51 | 0.012 | 0.012 |
| **354** | 28.5 | 2.65 | 127.9 | 16.74 | 906 | 1.57 | 0.015 | 0.0145 |

| **Element** | Fe2O3 | K2O | LOI | MgO | MnO | Na2O | Ni | P2O5 |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.04 | 0.04 | 0.1 | 0.01 | 0.01 | 0.01 | 30 | 0.01 |
| **Samples** | % | % | % | % | % | % | ppm | % |
| **300** | 6.67 | 2.53 | 15.2 | 1.73 | 0.02 | 0.71 | 70 | 0.18 |
| **316** | 5.28 | 2.86 | 13.5 | 1.57 | 0.02 | 0.6 | 64 | 0.2 |
| **320** | 4.5 | 2.77 | 13.7 | 1.56 | 0.01 | 0.58 | 70 | 0.19 |
| **325** | 4.6 | 2.45 | 16.6 | 1.55 | 0.01 | 0.49 | 50 | 0.18 |
| **329** | 4.63 | 2.64 | 14.6 | 1.77 | 0.01 | 0.6 | 56 | 0.2 |
| **334** | 4.39 | 1.95 | 20.6 | 2.22 | 0.02 | 0.49 | 36 | 0.2 |
| **339** | 3.83 | 2.69 | 14.3 | 1.68 | 0.01 | 0.55 | 45 | 0.21 |
| **342** | 4.74 | 2.54 | 16.5 | 1.67 | 0.02 | 0.55 | 55 | 0.22 |
| **348** | 4.99 | 2.21 | 19.4 | 1.57 | 0.01 | 0.49 | 63 | 0.2 |
| **351** | 5.47 | 2.49 | 16.6 | 1.64 | 0.01 | 0.53 | 42 | 0.23 |
| **354** | 5.44 | 2.95 | 11.5 | 1.78 | 0.01 | 0.61 | 56 | 0.19 |

|  |  |  |  |  |  |  | ***Analysis: CO2*** |  |
|---|---|---|---|---|---|---|---|---|
| **Element** | **Sc** | **SiO2** | **TiO2** | **TOT/C** | **TOT/S** | **SUM** | **C/ORG** | **C/GRA** |
| **LDL** | **1** | **0.02** | **0.01** | **0.01** | **0.01** |  |  |  |
| **Samples** | **ppm** | **%** | **%** | **%** | **%** | **%** | **%** | **%** |
| **300** | 16 | 53.6 | 0.69 | 5.76 | 3.32 | 99.5 | 5.12 | 0.07 |
| **316** | 14 | 55.77 | 0.69 | 4.15 | 2.66 | 99.75 | 3.3 | 0.05 |
| **320** | 17 | 54.82 | 0.68 | 4.53 | 2.01 | 99.77 | 3.33 | 0.03 |
| **325** | 13 | 49.84 | 0.6 | 6.44 | 2.61 | 99.79 | 4.27 | 0.05 |
| **329** | 11 | 52.79 | 0.6 | 4.89 | 2.5 | 99.78 | 3.03 | 0.04 |
| **334** | 9 | 41.74 | 0.47 | 7.67 | 2.6 | 99.84 | 4.05 | 0.03 |
| **339** | 12 | 54.32 | 0.63 | 5.1 | 2.11 | 99.74 | 3.52 | 0.03 |
| **342** | 12 | 50.12 | 0.61 | 5.99 | 2.9 | 99.82 | 4.05 | 0.06 |
| **348** | 11 | 45.91 | 0.53 | 8.33 | 3.4 | 99.77 | 6.07 | 0.02 |
| **351** | 12 | 50.08 | 0.59 | 6.39 | 3.38 | 99.74 | 4.64 | 0.11 |
| **354** | 15 | 57.72 | 0.75 | 3.12 | 2.67 | 99.39 | 2.63 | 0.06 |

| **Element** | **CO2** | **SO4** |
|---|---|---|
| **LDL** |  |  |
| **Samples** | **%** | **%** |
| **300** | 2.1 | 1.58 |
| **316** | 2.96 | 2.53 |
| **320** | 4.29 | 2.24 |
| **325** | 7.77 | 2.97 |
| **329** | 6.67 | 2.71 |
| **334** | 13.18 | 3.17 |
| **339** | 5.71 | 1.92 |
| **342** | 6.86 | 3.17 |
| **348** | 8.23 | 3.4 |
| **351** | 6.01 | 2.72 |
| **354** | 1.59 | 1.39 |

| Samples | Hole | Latitude | Longitude | From (m) | To (m) | Analysis Date |
|---|---|---|---|---|---|---|
| 356 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1803.410 | 1803.430 | Dec. 2003 |
| 357 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1804.400 | 1804.420 | Dec. 2003 |
| 358 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1805.440 | 1805.460 | Dec. 2003 |
| 359 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1806.360 | 1806.420 | Dec. 2003 |
| 360 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1807.450 | 1807.520 | Dec. 2003 |
| 361 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1807.620 | 1807.640 | Dec. 2003 |
| 362 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1808.320 | 1808.380 | Dec. 2003 |
| 363 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1809.360 | 1809.390 | Dec. 2003 |
| 364 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1810.360 | 1810.420 | Dec. 2003 |
| 365 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1811.360 | 1811.425 | Dec. 2003 |
| 366 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1812.300 | 1812.340 | Dec. 2003 |
| 367 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1813.340 | 1813.380 | Dec. 2003 |
| 368 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1814.310 | 1814.360 | Dec. 2003 |
| 369 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1815.250 | 1815.280 | Dec. 2003 |
| 370 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1812.300 | 1812.340 | Dec. 2003 |
| 371 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1813.340 | 1813.380 | Dec. 2003 |
| 372 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1814.310 | 1814.360 | Dec. 2003 |
| 373 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1819.145 | 1819.215 | Dec. 2003 |
| 374 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1812.300 | 1812.340 | Dec. 2003 |
| 375 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1813.340 | 1813.380 | Dec. 2003 |
| 376 | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1822.105 | 1822.175 | Dec. 2003 |
| 377 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2124.510 | 2124.560 | Dec. 2003 |
| 378 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2125.485 | 2125.525 | Dec. 2003 |
| 379 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2126.455 | 2126.515 | Dec. 2003 |
| 380 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2127.690 | 2127.760 | Dec. 2003 |
| 381 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2128.665 | 2128.725 | Dec. 2003 |
| 382 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2129.700 | 2129.750 | Dec. 2003 |
| 383 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2130.720 | 2130.790 | Dec. 2003 |
| 384 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2131.795 | 2131.845 | Dec. 2003 |
| 385 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2132.590 | 2132.650 | Dec. 2003 |
| 386 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2133.560 | 2133.610 | Dec. 2003 |
| 387 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2134.550 | 2134.600 | Dec. 2003 |
| 388 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2135.555 | 2135.610 | Dec. 2003 |
| 389 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2136.630 | 2136.680 | Dec. 2003 |
| 390 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2137.545 | 2137.605 | Dec. 2003 |
| 391 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2138.555 | 2138.615 | Dec. 2003 |
| 392 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2139.570 | 2139.640 | Dec. 2003 |
| 393 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2140.605 | 2140.650 | Dec. 2003 |
| 394 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2142.600 | 2142.640 | Dec. 2003 |
| 395 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2143.340 | 2143.390 | Dec. 2003 |
| 396 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2144.345 | 2144.390 | Dec. 2003 |
| 399 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2146.290 | 2146.335 | Dec. 2003 |
| 400 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2147.310 | 2147.360 | Dec. 2003 |
| 401 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2148.285 | 2148.350 | Dec. 2003 |
| 402 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2149.340 | 2148.390 | Dec. 2003 |
| 403 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2150.300 | 2150.350 | Dec. 2003 |
| 404 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2151.315 | 2151.370 | Dec. 2003 |
| 405 | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2152.300 | 2151.360 | Dec. 2003 |

| Samples | Probability of Fm | Formation | Sample Description |
|---|---|---|---|
| 356 | Probable | Second White Specks | Dk grey shale fragments, minor silt |
| 357 | Probable | Second White Specks | Dk grey shale, broken fragments, some silt |
| 358 | Probable | Second White Specks | Dk grey shale, minor silt and micas |
| 359 | Probable | Second White Specks | Dk grey shale, some silt, organic fragments |
| 360 | Probable | Second White Specks | Dk grey shale, some silt, smooth |
| 361 | Probable | Second White Specks | Pyrite/vitreous black |
| 362 | Probable | Second White Specks | Dk grey shale |
| 363 | Probable | Second White Specks | Broken fragments of shale, smooth, minor silt, fish fragments |
| 364 | Probable | Second White Specks | Dk grey shale, minor silt |
| 365 | Probable | Second White Specks | Dk grey shale, minor silt |
| 366 | Known | Second White Specks | Broken fragments of shale, some silt |
| 367 | Unknown | Second White Specks | Broken fragments of shale, micas |
| 368 | Unknown | Second White Specks | Dk grey shale, micas, wisps of silt |
| 369 | Unknown | Second White Specks | Dk grey shale, micas, wisps of silt |
| 370 | Unknown | Second White Specks | Dk grey shale, micas, some silt |
| 371 | Unknown | Second White Specks | Dk grey shale, micas |
| 372 | Unknown | Second White Specks | Dk grey shale, micas |
| 373 | Unknown | Second White Specks | Dk grey shale, shelly fragments, silty wisps |
| 374 | Unknown | Second White Specks | Dk grey shale, smooth, micas, some shells |
| 375 | Unknown | Second White Specks | Dk grey shale, fish fragments, micas |
| 376 | Unknown | Second White Specks | Dk grey shale, organic debris, smooth, shelly fragments, micas |
| 377 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, some silty pockets/lams |
| 378 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silt lams/pockets, smooth |
| 379 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silty lams |
| 380 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silty lams |
| 381 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silty/sandy lams/pockets |
| 382 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, micas, silt, fish fragments |
| 383 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silty lams |
| 384 | Unknown | Belle Fourche (or underlying shale) | Broken fragments of shale, silty pockets |
| 385 | Unknown | Belle Fourche (or underlying shale) | Broken fragments of shale, silt pockets/lams |
| 386 | Unknown | Belle Fourche (or underlying shale) | Broken fragments of shale, silt, micas |
| 387 | Unknown | Belle Fourche (or underlying shale) | Broken fragments of shale, silty lams, organic fragments |
| 388 | Unknown | Belle Fourche (or underlying shale) | Broken fragments of shale, shelly debris, minor silt |
| 389 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, shelly fragments, fish fragments, micas, silty lams |
| 390 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, some shelly debris |
| 391 | Unknown | Belle Fourche (or underlying shale) | Broken fragments of shale, fish fragments |
| 392 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, small amount of silt, fish debris |
| 393 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silty lams, shelly debris |
| 394 | Unknown | Belle Fourche (or underlying shale) | Broken fragments of shale, micas, a little silt |
| 395 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silt lams |
| 396 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silt, some fish fragments |
| 399 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, some silt |
| 400 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, some silt, some black organic fragments |
| 401 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silt, black organic remains |
| 402 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, smooth, some silt, some black organic remains |
| 403 | Unknown | Belle Fourche (or underlying shale) | Broken fragments of shale, some silt, some fish fragments |
| 404 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, smooth, some silt, some fish remains |
| 405 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, smooth, some silt, some black organic remains |

***Analysis: GROUP 1F1 - 1.00 GM***

| **Element** | **Ag** | **Al** | **As** | **Au** | **B** | **Ba** | **Be** | **Bi** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** | **0.1** | **0.02** |
| **Samples** | **ppb** | **%** | **ppm** | **ppb** | **ppm** | **ppm** | **ppm** | **ppm** |
| **300** | 635 | 1.17 | 29.9 | < .2 | 6 | 36.4 | | 0.51 |
| **302** | 399 | 1.05 | 24.2 | 0.3 | 8 | 58.4 | | 0.45 |
| **303** | 309 | 1.04 | 27.9 | < .2 | 8 | 55.3 | | 0.51 |
| **307** | 547 | 1.1 | 23.3 | 0.9 | 8 | 49.7 | | 0.39 |
| **308** | 655 | 1.14 | 37.1 | 0.2 | 5 | 30 | | 0.44 |
| **309** | 620 | 1.08 | 41.5 | 0.4 | 6 | 29.1 | | 0.47 |
| **310** | 467 | 1.17 | 28.5 | 0.4 | 6 | 38.4 | | 0.42 |
| **311** | 213 | 0.55 | 15.4 | 0.3 | 5 | 84.2 | | 0.22 |
| **312** | 417 | 1.19 | 31.3 | 0.4 | 8 | 41.1 | | 0.48 |
| **313** | 410 | 1.15 | 28.9 | 0.6 | 10 | 49.9 | | 0.4 |
| **314** | 400 | 1.16 | 30.5 | 0.6 | 10 | 53.7 | | 0.39 |
| **315** | 348 | 1.19 | 30.2 | 0.2 | 9 | 52.6 | | 0.39 |
| **316** | 349 | 1.26 | 29.6 | < .2 | 14 | 57.9 | 0.8 | 0.3 |
| **317** | 275 | 1.08 | 28 | < .2 | 11 | 56 | | 0.26 |
| **318** | 257 | 1.04 | 22.9 | 0.5 | 11 | 68 | | 0.21 |
| **319** | 281 | 0.99 | 25.4 | 0.3 | 14 | 61.3 | | 0.24 |
| **320** | 292 | 1.19 | 21.8 | 0.2 | 13 | 77.5 | 0.8 | 0.29 |
| **321** | 283 | 0.9 | 25.9 | 0.3 | 10 | 58.6 | | 0.23 |
| **322** | 249 | 0.93 | 24.9 | < .2 | 11 | 67.1 | | 0.22 |
| **323** | 295 | 0.89 | 28.4 | < .2 | 12 | 48.5 | | 0.25 |
| **324** | 248 | 0.71 | 21.2 | < .2 | 10 | 120 | | 0.2 |
| **325** | 350 | 0.85 | 24.8 | 0.3 | 11 | 58.2 | 0.7 | 0.28 |
| **326** | 301 | 0.8 | 23.7 | 0.4 | 12 | 53.5 | | 0.23 |
| **327** | 295 | 0.79 | 26.2 | 0.5 | 12 | 48.4 | | 0.25 |
| **328** | 333 | 0.73 | 23.7 | 0.6 | 10 | 57.8 | | 0.25 |
| **329** | 364 | 0.97 | 24.3 | 1.1 | 14 | 65 | 0.7 | 0.26 |
| **330** | 342 | 0.7 | 24.4 | < .2 | 12 | 45.4 | | 0.24 |
| **332** | 339 | 0.73 | 23.3 | 0.4 | 10 | 56.2 | | 0.25 |
| **333** | 372 | 0.66 | 36 | 0.4 | 10 | 35.2 | | 0.3 |
| **334** | 315 | 0.74 | 26.5 | 0.3 | 11 | 72.3 | 0.5 | 0.21 |
| **335** | 293 | 0.63 | 25.7 | 0.3 | 11 | 64.6 | | 0.2 |
| **336** | 266 | 0.45 | 18.4 | < .2 | 6 | 87.1 | | 0.16 |
| **338** | 318 | 0.59 | 42.6 | 1.4 | 5 | 32.6 | | 0.2 |
| **339** | 313 | 0.85 | 18.6 | < .2 | 13 | 81.5 | 0.6 | 0.27 |
| **340** | 281 | 0.66 | 15.8 | < .2 | 6 | 71.6 | | 0.23 |
| **341** | 298 | 0.76 | 13.3 | 0.8 | 8 | 83 | | 0.24 |
| **342** | 300 | 0.94 | 28.4 | 0.2 | 12 | 56.2 | 0.7 | 0.25 |
| **343** | 331 | 0.62 | 20.4 | 0.4 | 8 | 50 | | 0.2 |
| **344** | 297 | 0.65 | 27.9 | 0.5 | 6 | 42.9 | | 0.22 |
| **345** | 264 | 0.57 | 25.5 | 0.4 | 6 | 51.8 | | 0.19 |
| **346** | 476 | 0.56 | 27.6 | 0.4 | 9 | 47.1 | | 0.21 |
| **347** | 284 | 0.44 | 460 | < .2 | 4 | 6.3 | | 0.18 |
| **348** | 321 | 0.82 | 32.1 | < .2 | 12 | 50.9 | 0.5 | 0.25 |
| **349** | 237 | 0.69 | 30.4 | 0.4 | 8 | 32.2 | | 0.27 |
| **350** | 247 | 0.54 | 25.9 | < .2 | 9 | 40.2 | | 0.22 |
| **351** | 368 | 0.85 | 31.8 | 0.7 | 13 | 48.1 | 0.6 | 0.27 |
| **352** | 263 | 0.69 | 28.4 | < .2 | 9 | 39.7 | | 0.21 |
| **353** | 235 | 0.85 | 23.7 | < .2 | 7 | 32.8 | | 0.25 |
| **354** | 200 | 1.19 | 24.4 | 0.6 | 13 | 56.8 | 0.7 | 0.29 |
| **355** | 185 | 0.92 | 21.8 | 0.4 | 6 | 37.6 | | 0.27 |

| Element | Ca | Cd | Ce | Co | Cr | Cs | Cu | Fe |
|---|---|---|---|---|---|---|---|---|
| LDL | 0.01 | 0.01 | 0.1 | 0.1 | 0.5 | 0.02 | 0.01 | 0.01 |
| Samples | % | ppm | ppm | ppm | ppm | ppm | ppm | % |
| 300 | 1.04 | 7.48 |  | 19.6 | 17.8 |  | 68.38 | 3.75 |
| 302 | 0.26 | 1.53 |  | 15.5 | 16.4 |  | 54 | 2.64 |
| 303 | 0.84 | 1.09 |  | 14.1 | 14.9 |  | 43.41 | 3.09 |
| 307 | 0.3 | 1.75 |  | 16.9 | 18.3 |  | 58.05 | 2.96 |
| 308 | 0.38 | 2.3 |  | 22.7 | 18.5 |  | 70.94 | 3.86 |
| 309 | 0.27 | 2.18 |  | 22.8 | 17.5 |  | 66.39 | 4.13 |
| 310 | 0.25 | 1.73 |  | 19.7 | 19.2 |  | 59.41 | 3.45 |
| 311 | 2.19 | 0.7 |  | 10.6 | 17.5 |  | 27.88 | 16.75 |
| 312 | 0.26 | 1 |  | 20.6 | 18.6 |  | 58.21 | 3.54 |
| 313 | 0.23 | 1.48 |  | 18.3 | 19.7 |  | 55.22 | 3.38 |
| 314 | 0.63 | 1.67 |  | 18.7 | 20.6 |  | 54.94 | 3.28 |
| 315 | 0.26 | 1.11 |  | 19.3 | 19.1 |  | 52.15 | 3.48 |
| 316 | 2.5 | 1.1 | 10.7 | 12.9 | 21.2 | 1.46 | 53.02 | 2.83 |
| 317 | 3.46 | 0.75 |  | 13.5 | 16.2 |  | 36.13 | 2.81 |
| 318 | 3.22 | 1.22 |  | 12.7 | 15.7 |  | 30.51 | 2.31 |
| 319 | 3.57 | 0.68 |  | 13.5 | 16.7 |  | 33.11 | 2.6 |
| 320 | 3.58 | 1.41 | 12.2 | 12.4 | 19.2 | 1.4 | 39.13 | 2.33 |
| 321 | 4.35 | 1 |  | 13.6 | 15.2 |  | 33.45 | 2.52 |
| 322 | 3.73 | 1.33 |  | 12.7 | 14.8 |  | 29.53 | 2.26 |
| 323 | 3.89 | 1.22 |  | 13.4 | 16.1 |  | 32.59 | 2.57 |
| 324 | 11.37 | 1.49 |  | 10.9 | 12.7 |  | 28.32 | 2.09 |
| 325 | 6.32 | 1.24 | 11.4 | 13 | 15.3 | 1.08 | 39.44 | 2.49 |
| 326 | 4.56 | 1.14 |  | 12 | 13.8 |  | 31.59 | 2.41 |
| 327 | 4.88 | 1.04 |  | 13.5 | 13.1 |  | 34.16 | 2.65 |
| 328 | 4.61 | 1.37 |  | 13.2 | 13.3 |  | 33.71 | 2.35 |
| 329 | 5.32 | 0.99 | 11.2 | 13.3 | 16.6 | 1.14 | 38.54 | 2.55 |
| 330 | 5.28 | 1.31 |  | 14 | 12.4 |  | 37.6 | 2.72 |
| 332 | 4.93 | 1.68 |  | 13 | 13.1 |  | 37.84 | 2.36 |
| 333 | 3.93 | 1.31 |  | 15.7 | 12.2 |  | 42.09 | 3.05 |
| 334 | 10.29 | 1.19 | 13.2 | 12.3 | 14.5 | 0.96 | 34.82 | 2.63 |
| 335 | 7.36 | 1.29 |  | 12.1 | 11.2 |  | 30.95 | 2.38 |
| 336 | 8.37 | 1.08 |  | 8.9 | 10.9 |  | 27.2 | 2.08 |
| 338 | 5.67 | 1.63 |  | 11.1 | 9.7 |  | 32.53 | 3.42 |
| 339 | 4.59 | 1.45 | 10.7 | 12.3 | 14.5 | 1.26 | 35.81 | 2 |
| 340 | 3.97 | 2.5 |  | 9.9 | 12.4 |  | 35.32 | 1.78 |
| 341 | 3.52 | 1.17 |  | 9.3 | 13.2 |  | 34.59 | 1.7 |
| 342 | 5.59 | 1.23 | 12 | 14.1 | 15.4 | 1.08 | 38.65 | 2.66 |
| 343 | 4.67 | 2 |  | 11 | 11.7 |  | 33.2 | 2.27 |
| 344 | 4.66 | 1.27 |  | 13.3 | 12.2 |  | 32.28 | 2.58 |
| 345 | 6.92 | 1.46 |  | 10.8 | 10.7 |  | 28.3 | 2.48 |
| 346 | 5.62 | 2.6 |  | 16.6 | 11.6 |  | 42.51 | 2.57 |
| 347 | 4.25 | 1.16 |  | 11.5 | 9.8 |  | 26.93 | 14.32 |
| 348 | 6.62 | 1.44 | 13.3 | 15 | 12.6 | 1 | 38.84 | 2.87 |
| 349 | 3.28 | 0.89 |  | 13 | 13.1 |  | 30.26 | 3.31 |
| 350 | 5.6 | 0.81 |  | 12.5 | 12.8 |  | 30.16 | 2.99 |
| 351 | 4.95 | 1.89 | 12.8 | 19.6 | 14.1 | 1.14 | 50.16 | 3.17 |
| 352 | 5.26 | 1.12 |  | 14.9 | 13.6 |  | 33.18 | 3.18 |
| 353 | 1.42 | 0.92 |  | 12.5 | 15.4 |  | 34.22 | 3.11 |
| 354 | 0.99 | 0.52 | 9.2 | 12.8 | 21.8 | 1.58 | 33.58 | 3.13 |
| 355 | 0.92 | 0.61 |  | 12.8 | 18.3 |  | 28.95 | 3.2 |

| **Element** | Ga | Ge | Hf | Hg | In | K | La | Li |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.1 | 0.1 | 0.02 | 5 | 0.02 | 0.01 | 0.5 | 0.1 |
| **Samples** | ppm | ppm | ppm | ppb | ppm | % | ppm | ppm |
| **300** | 3.6 | | | 169 | | 0.31 | 5.1 | |
| **302** | 3.1 | | | 177 | | 0.28 | 3.9 | |
| **303** | 3.4 | | | 154 | | 0.27 | 4.8 | |
| **307** | 3.1 | | | 365 | | 0.28 | 4.5 | |
| **308** | 3.2 | | | 270 | | 0.27 | 4.7 | |
| **309** | 3.2 | | | 203 | | 0.25 | 3.8 | |
| **310** | 3.5 | | | 375 | | 0.27 | 3.9 | |
| **311** | 1.7 | | | 90 | | 0.12 | 6.9 | |
| **312** | 3.6 | | | 203 | | 0.26 | 3.8 | |
| **313** | 3.4 | | | 341 | | 0.25 | 3.7 | |
| **314** | 3.7 | | | 181 | | 0.26 | 3.9 | |
| **315** | 3.5 | | | 196 | | 0.26 | 3.6 | |
| **316** | 4 | < .1 | 0.07 | 142 | 0.05 | 0.38 | 5 | 19.5 |
| **317** | 3.3 | | | 107 | | 0.28 | 5.3 | |
| **318** | 3 | | | 149 | | 0.3 | 4.7 | |
| **319** | 3.1 | | | 133 | | 0.28 | 4.8 | |
| **320** | 3.8 | < .1 | 0.08 | 98 | 0.04 | 0.36 | 5.5 | 19.3 |
| **321** | 2.8 | | | 134 | | 0.27 | 4.7 | |
| **322** | 2.8 | | | 145 | | 0.27 | 4.3 | |
| **323** | 2.9 | | | 207 | | 0.28 | 4.5 | |
| **324** | 2.6 | | | 140 | | 0.22 | 5.4 | |
| **325** | 3.2 | < .1 | 0.05 | 123 | 0.05 | 0.3 | 5.3 | 10.3 |
| **326** | 2.7 | | | 125 | | 0.26 | 5 | |
| **327** | 2.9 | | | 123 | | 0.25 | 4.9 | |
| **328** | 2.4 | | | 104 | | 0.23 | 4.8 | |
| **329** | 3.3 | < .1 | 0.07 | 112 | 0.04 | 0.35 | 5.1 | 11.6 |
| **330** | 2.8 | | | 266 | | 0.23 | 5.7 | |
| **332** | 2.7 | | | 99 | | 0.24 | 5.2 | |
| **333** | 2.7 | | | 158 | | 0.23 | 4.6 | |
| **334** | 2.9 | < .1 | 0.06 | 126 | 0.03 | 0.28 | 6.2 | 8.4 |
| **335** | 2.6 | | | 165 | | 0.22 | 5.6 | |
| **336** | 2 | | | 66 | | 0.19 | 4.5 | |
| **338** | 2.4 | | | 125 | | 0.19 | 4.1 | |
| **339** | 3 | < .1 | 0.05 | 102 | 0.05 | 0.32 | 4.8 | 10.9 |
| **340** | 2.4 | | | 78 | | 0.24 | 4.3 | |
| **341** | 2.6 | | | 69 | | 0.27 | 4.2 | |
| **342** | 3.4 | < .1 | 0.08 | 115 | 0.04 | 0.33 | 5.6 | 11.2 |
| **343** | 2.4 | | | 120 | | 0.22 | 4 | |
| **344** | 2.6 | | | 85 | | 0.23 | 4 | |
| **345** | 2.6 | | | 111 | | 0.21 | 4.7 | |
| **346** | 2.6 | | | 111 | | 0.21 | 4.1 | |
| **347** | 2.1 | | | 144 | | 0.16 | 3.5 | |
| **348** | 3.9 | < .1 | 0.06 | 178 | 0.04 | 0.27 | 5.8 | 10 |
| **349** | 2.8 | | | 130 | | 0.25 | 4.4 | |
| **350** | 2.5 | | | 115 | | 0.21 | 4.6 | |
| **351** | 3.3 | < .1 | 0.07 | 107 | 0.05 | 0.32 | 5.6 | 9.3 |
| **352** | 2.8 | | | 99 | | 0.24 | 4.4 | |
| **353** | 4.1 | | | 143 | | 0.27 | 4.5 | |
| **354** | 3.8 | < .1 | 0.09 | 86 | 0.05 | 0.34 | 4.3 | 23.2 |
| **355** | 3.2 | | | 107 | | 0.25 | 3.3 | |

| **Element** | Mg | Mn | Mo | Na | Nb | Ni | P | Pb |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.01 | 1 | 0.01 | 0.001 | 0.02 | 0.1 | 0.001 | 0.01 |
| **Samples** | % | ppm | ppm | % | ppm | ppm | % | ppm |
| **300** | 0.55 | 178 | 28.9 | 0.251 | | 80.8 | 0.06 | 23.36 |
| **302** | 0.3 | 103 | 17.8 | 0.254 | | 67.5 | 0.06 | 19.81 |
| **303** | 0.46 | 153 | 14.54 | 0.231 | | 51.7 | 0.059 | 21.98 |
| **307** | 0.28 | 104 | 12.55 | 0.214 | | 61.3 | 0.068 | 20.52 |
| **308** | 0.32 | 130 | 23.6 | 0.204 | | 82.9 | 0.061 | 22.1 |
| **309** | 0.32 | 122 | 21.11 | 0.237 | | 75.4 | 0.057 | 22.73 |
| **310** | 0.34 | 142 | 16.99 | 0.231 | | 65.2 | 0.062 | 22.4 |
| **311** | 3.25 | 2193 | 13.95 | 0.098 | | 33.5 | 0.034 | 10.74 |
| **312** | 0.38 | 173 | 18.36 | 0.244 | | 69.7 | 0.063 | 24.09 |
| **313** | 0.39 | 160 | 13.76 | 0.211 | | 63 | 0.063 | 21.41 |
| **314** | 0.45 | 130 | 15.09 | 0.232 | | 64.6 | 0.064 | 20.71 |
| **315** | 0.42 | 166 | 12.12 | 0.224 | | 65 | 0.06 | 20.75 |
| **316** | 0.46 | 119 | 16.78 | 0.233 | 0.04 | 56.6 | 0.066 | 16.71 |
| **317** | 0.53 | 96 | 15.75 | 0.205 | | 43.9 | 0.07 | 14.95 |
| **318** | 0.43 | 76 | 11.87 | 0.22 | | 47.3 | 0.067 | 12.6 |
| **319** | 0.53 | 89 | 14.28 | 0.215 | | 51 | 0.062 | 13.99 |
| **320** | 0.45 | 74 | 9.72 | 0.236 | 0.04 | 56.7 | 0.067 | 15.51 |
| **321** | 0.49 | 74 | 14.17 | 0.201 | | 53.7 | 0.065 | 13.51 |
| **322** | 0.45 | 79 | 11.3 | 0.204 | | 50.8 | 0.058 | 13.31 |
| **323** | 0.53 | 81 | 13.29 | 0.194 | | 59.2 | 0.062 | 14.91 |
| **324** | 0.47 | 82 | 14.23 | 0.188 | | 49.8 | 0.078 | 11.06 |
| **325** | 0.48 | 87 | 16.28 | 0.194 | 0.04 | 59.4 | 0.071 | 15.57 |
| **326** | 0.47 | 65 | 13.66 | 0.183 | | 49.3 | 0.064 | 13.78 |
| **327** | 0.54 | 102 | 19.89 | 0.199 | | 46.9 | 0.06 | 14.32 |
| **328** | 0.51 | 67 | 13.3 | 0.188 | | 55.6 | 0.063 | 14.79 |
| **329** | 0.59 | 84 | 14.23 | 0.214 | 0.07 | 49.6 | 0.073 | 25.94 |
| **330** | 0.58 | 105 | 24.71 | 0.171 | | 53.4 | 0.068 | 15.26 |
| **332** | 0.51 | 75 | 17.83 | 0.185 | | 64.6 | 0.063 | 15.08 |
| **333** | 0.46 | 79 | 26.35 | 0.182 | | 66.6 | 0.065 | 15.79 |
| **334** | 0.93 | 127 | 18.57 | 0.176 | 0.07 | 45.6 | 0.073 | 13.65 |
| **335** | 0.61 | 85 | 18.81 | 0.161 | | 51.3 | 0.072 | 12.88 |
| **336** | 1.04 | 106 | 6.88 | 0.153 | | 32.5 | 0.057 | 9.93 |
| **338** | 0.55 | 114 | 36.25 | 0.18 | | 53.8 | 0.072 | 12.59 |
| **339** | 0.52 | 59 | 8.82 | 0.209 | 0.03 | 52.2 | 0.07 | 14.98 |
| **340** | 0.52 | 64 | 6.49 | 0.207 | | 42.7 | 0.061 | 12.85 |
| **341** | 0.47 | 68 | 5.52 | 0.219 | | 40.5 | 0.056 | 12.59 |
| **342** | 0.55 | 105 | 19.63 | 0.207 | 0.06 | 49 | 0.077 | 13.9 |
| **343** | 0.49 | 73 | 10.25 | 0.194 | | 51.5 | 0.058 | 12.67 |
| **344** | 0.52 | 77 | 16.82 | 0.199 | | 59.5 | 0.06 | 12.93 |
| **345** | 0.54 | 97 | 18.43 | 0.172 | | 54.7 | 0.066 | 11.66 |
| **346** | 0.51 | 71 | 25.63 | 0.183 | | 82.7 | 0.063 | 12.47 |
| **347** | 0.47 | 107 | 114.36 | 0.135 | | 48.9 | 0.06 | 10.9 |
| **348** | 0.52 | 101 | 27.58 | 0.182 | 0.06 | 58.8 | 0.066 | 13.89 |
| **349** | 0.64 | 96 | 4.48 | 0.213 | | 37.1 | 0.071 | 15.24 |
| **350** | 0.55 | 97 | 4.63 | 0.179 | | 39.1 | 0.066 | 13.69 |
| **351** | 0.53 | 83 | 10.26 | 0.208 | 0.04 | 58 | 0.079 | 16.67 |
| **352** | 0.7 | 122 | 7.87 | 0.189 | | 42.4 | 0.068 | 12.87 |
| **353** | 0.59 | 106 | 9.97 | 0.238 | | 51.4 | 0.062 | 14.63 |
| **354** | 0.55 | 104 | 5.25 | 0,255 | 0.03 | 42.6 | 0.064 | 16.74 |
| **355** | 0.45 | 91 | 3.34 | 0.253 | | 43.9 | 0.052 | 15.99 |

| Element | Pd | Pt | Rb | Re | S | Sb | Sc | Se |
|---|---|---|---|---|---|---|---|---|
| LDL | 10 | 2 | 0.1 | 1 | 0.02 | 0.02 | 0.1 | 0.1 |
| Samples | ppb | ppb | ppm | ppb | % | ppm | ppm | ppm |
| 300 | | | | | 2.34 | 1.66 | 5.4 | 5.5 |
| 302 | | | | | 1.75 | 1.43 | 3.3 | 3.5 |
| 303 | | | | | 1.94 | 1.4 | 5.3 | 2.6 |
| 307 | | | | | 1.98 | 1.12 | 3.3 | 4.2 |
| 308 | | | | | 2.92 | 1.73 | 3.9 | 6.7 |
| 309 | | | | | 3.16 | 1.63 | 3.7 | 5.8 |
| 310 | | | | | 2.35 | 1.4 | 3.9 | 4.2 |
| 311 | | | | | 1.1 | 0.82 | 11.5 | 2.1 |
| 312 | | | | | 2.41 | 1.34 | 4.3 | 3.9 |
| 313 | | | | | 2.12 | 1.42 | 4.3 | 3.2 |
| 314 | | | | | 2.19 | 1.5 | 4.6 | 3.1 |
| 315 | | | | | 2.13 | 1.39 | 4.8 | 3 |
| 316 | < 10 | < 2 | 23.2 | 21 | 1.85 | 1.06 | 5.2 | 2.8 |
| 317 | | | | | 1.86 | 0.8 | 6 | 2.2 |
| 318 | | | | | 1.45 | 0.99 | 5.1 | 2.2 |
| 319 | | | | | 1.77 | 0.81 | 5.5 | 2.4 |
| 320 | < 10 | < 2 | 21.7 | 22 | 1.44 | 0.95 | 6.6 | 3 |
| 321 | | | | | 1.77 | 0.98 | 5.2 | 2.6 |
| 322 | | | | | 1.52 | 0.97 | 4.2 | 2.4 |
| 323 | | | | | 1.93 | 1.21 | 4.9 | 3.6 |
| 324 | | | | | 1.36 | 0.91 | 6 | 2.6 |
| 325 | < 10 | < 2 | 18.8 | 36 | 1.91 | 1.11 | 5.5 | 3.5 |
| 326 | | | | | 1.84 | 1.29 | 4.7 | 3 |
| 327 | | | | | 2.05 | 1.08 | 4.6 | 3.1 |
| 328 | | | | | 1.79 | 1.36 | 4.3 | 3.6 |
| 329 | < 10 | < 2 | 19.8 | 23 | 1.86 | 1.02 | 4.6 | 3 |
| 330 | | | | | 2.12 | 1 | 5 | 3.5 |
| 332 | | | | | 1.8 | 1.37 | 5.1 | 4.3 |
| 333 | | | | | 2.61 | 1.47 | 4.1 | 4.4 |
| 334 | < 10 | < 2 | 16.1 | 28 | 1.97 | 1.09 | 4.8 | 3.4 |
| 335 | | | | | 1.83 | 1.32 | 4.4 | 3 |
| 336 | | | | | 1.5 | 0.78 | 3.5 | 2.1 |
| 338 | | | | | 3.22 | 2.29 | 2.8 | 5.9 |
| 339 | < 10 | < 2 | 19.3 | 29 | 1.5 | 0.73 | 4.5 | 2.9 |
| 340 | | | | | 1.49 | 0.91 | 3.5 | 3 |
| 341 | | | | | 1.32 | 0.82 | 3.6 | 2.5 |
| 342 | < 10 | < 2 | 19.4 | 32 | 2.04 | 1.09 | 4.8 | 3.4 |
| 343 | | | | | 1.92 | 1.15 | 4.3 | 3.3 |
| 344 | | | | | 2.24 | 1.3 | 4.1 | 3.3 |
| 345 | | | | | 2.15 | 1.16 | 4.8 | 2.9 |
| 346 | | | | | 2.16 | 1.9 | 3.6 | 5.4 |
| 347 | | | | | 16.63 | 4.88 | 2.4 | 14.2 |
| 348 | < 10 | < 2 | 16.3 | 46 | 2.42 | 1.82 | 4.9 | 4.5 |
| 349 | | | | | 2.96 | 1.08 | 3.5 | 2.4 |
| 350 | | | | | 2.48 | 1.04 | 4.3 | 2.3 |
| 351 | < 10 | < 2 | 19.5 | 19 | 2.69 | 1.32 | 4.4 | 4.4 |
| 352 | | | | | 2.5 | 0.95 | 4.6 | 3 |
| 353 | | | | | 2.68 | 0.8 | 4.1 | 4.8 |
| 354 | < 10 | < 2 | 22.7 | 10 | 2 | 0.57 | 4.7 | 2.2 |
| 355 | | | | | 2.48 | 0.53 | 4.2 | 1.9 |

| **Element** | Sn | Sr | Ta | Te | Th | Ti | Tl | U |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.1 | 0.5 | 0.05 | 0.02 | 0.1 | 0.001 | 0.02 | 0.1 |
| **Samples** | ppm | ppm | ppm | ppm | ppm | % | ppm | ppm |
| **300** |  | 110.7 |  | 0.12 | 7 | 0.01 | 0.31 | 3.6 |
| **302** |  | 83.6 |  | 0.07 | 6.3 | 0.004 | 0.4 | 2.13 |
| **303** |  | 103.7 |  | 0.09 | 7.2 | 0.013 | 0.54 | 2.27 |
| **307** |  | 81.5 |  | 0.1 | 5.7 | 0.001 | 0.53 | 3.15 |
| **308** |  | 76.6 |  | 0.15 | 6 | 0.004 | 0.53 | 3.66 |
| **309** |  | 77.8 |  | 0.18 | 5.9 | 0.009 | 0.52 | 3.62 |
| **310** |  | 78.8 |  | 0.14 | 6.3 | < .001 | 0.4 | 2.97 |
| **311** |  | 87.3 |  | 0.08 | 3.4 | 0.001 | 0.41 | 4.21 |
| **312** |  | 83.5 |  | 0.09 | 7 | 0.004 | 0.44 | 2.84 |
| **313** |  | 74.1 |  | 0.12 | 5.7 | < .001 | 0.38 | 2.42 |
| **314** |  | 99.2 |  | 0.1 | 6.1 | 0.005 | 0.36 | 2.6 |
| **315** |  | 80.9 |  | 0.11 | 5.8 | 0.005 | 0.36 | 2.33 |
| **316** | 0.7 | 84.2 | < .05 | 0.09 | 4.9 | 0.007 | 0.22 | 3.13 |
| **317** |  | 106.9 |  | 0.05 | 5.1 | < .001 | 0.16 | 3.61 |
| **318** |  | 107.4 |  | 0.06 | 4.3 | < .001 | 0.19 | 3.05 |
| **319** |  | 119.3 |  | 0.06 | 4.6 | < .001 | 0.21 | 2.93 |
| **320** | 0.8 | 111.6 | < .05 | 0.1 | 5.4 | < .001 | 0.29 | 2.97 |
| **321** |  | 145.7 |  | 0.09 | 4.6 | 0.006 | 0.26 | 3.16 |
| **322** |  | 155.6 |  | 0.09 | 4.5 | < .001 | 0.26 | 2.36 |
| **323** |  | 110.8 |  | 0.09 | 4.7 | < .001 | 0.37 | 2.65 |
| **324** |  | 395.7 |  | 0.06 | 3.5 | 0.002 | 0.23 | 7.17 |
| **325** | 0.6 | 223.5 | < .05 | 0.08 | 4.7 | 0.01 | 0.22 | 3.75 |
| **326** |  | 184.1 |  | 0.11 | 4.3 | < .001 | 0.25 | 2.92 |
| **327** |  | 149.4 |  | 0.06 | 4.5 | < .001 | 0.18 | 3.67 |
| **328** |  | 124.8 |  | 0.09 | 4.7 | 0.002 | 0.39 | 2.63 |
| **329** | 0.6 | 196.4 | < .05 | 0.09 | 4.7 | 0.001 | 0.21 | 3.51 |
| **330** |  | 141.5 |  | 0.08 | 4.5 | < .001 | 0.19 | 5.58 |
| **332** |  | 133 |  | 0.1 | 4.6 | 0.002 | 0.37 | 3.27 |
| **333** |  | 106 |  | 0.09 | 4.4 | 0.007 | 0.3 | 3.82 |
| **334** | 0.4 | 294.5 | < .05 | 0.08 | 4.1 | 0.003 | 0.17 | 5.24 |
| **335** |  | 204.4 |  | 0.06 | 4.3 | < .001 | 0.29 | 5.15 |
| **336** |  | 221.6 |  | 0.07 | 3.5 | < .001 | 0.17 | 2.65 |
| **338** |  | 162.6 |  | 0.11 | 4.1 | < .001 | 0.69 | 2.89 |
| **339** | 0.6 | 120.5 | < .05 | 0.09 | 4.9 | 0.002 | 0.27 | 2.36 |
| **340** |  | 108.4 |  | 0.05 | 4.9 | < .001 | 0.24 | 1.87 |
| **341** |  | 94.2 |  | 0.05 | 4.9 | < .001 | 0.21 | 1.62 |
| **342** | 0.6 | 144.8 | < .05 | 0.08 | 4.7 | 0.002 | 0.16 | 4.17 |
| **343** |  | 124.6 |  | 0.09 | 4.5 | < .001 | 0.45 | 2.24 |
| **344** |  | 138.9 |  | 0.06 | 4.4 | < .001 | 0.37 | 2.93 |
| **345** |  | 193.5 |  | 0.07 | 4.3 | 0.005 | 0.25 | 4.41 |
| **346** |  | 135.1 |  | 0.12 | 3.7 | < .001 | 0.55 | 4.78 |
| **347** |  | 100.3 |  | 0.11 | 3.6 | < .001 | 0.39 | 2.76 |
| **348** | 0.6 | 157.2 | < .05 | 0.13 | 4.8 | 0.008 | 0.24 | 6.22 |
| **349** |  | 90.2 |  | 0.09 | 5.2 | < .001 | 0.12 | 1.9 |
| **350** |  | 136.2 |  | 0.11 | 4.4 | < .001 | 0.17 | 2.35 |
| **351** | 0.5 | 118.8 | < .05 | 0.2 | 5 | 0.003 | 0.23 | 2.97 |
| **352** |  | 117.7 |  | 0.1 | 3.8 | < .001 | 0.16 | 2.86 |
| **353** |  | 58.1 |  | 0.15 | 5.1 | 0.002 | 0.24 | 2.8 |
| **354** | 0.6 | 62.9 | < .05 | 0.11 | 4.8 | 0.004 | 0.15 | 1.96 |
| **355** |  | 60.4 |  | 0.12 | 5.2 | < .001 | 0.2 | 1.19 |

***Analysis: GROUP 1EX - 0.25 GM***

| **Element** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ag** | **Al** | **As** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.1** | **0.01** | **0.1** | **0.1** | **0.1** | **0.01** | **1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** |
| **300** | 75 | < .1 | | 896.9 | | 0.6 | 8.3 | 27 |
| **302** | 37 | < .1 | | 157.4 | | | | |
| **303** | 39 | < .1 | | 132 | | | | |
| **307** | 43 | < .1 | | 162.3 | | | | |
| **308** | 53 | < .1 | | 175.4 | | | | |
| **309** | 46 | < .1 | | 188.1 | | | | |
| **310** | 41 | < .1 | | 165.9 | | | | |
| **311** | 94 | < .1 | | 82.8 | | | | |
| **312** | 42 | < .1 | | 136.6 | | | | |
| **313** | 43 | < .1 | | 156 | | | | |
| **314** | 41 | < .1 | | 201.4 | | | | |
| **315** | 42 | < .1 | | 158.2 | | | | |
| **316** | 55 | 0.1 | 10.58 | 176.1 | 2.6 | 0.3 | 7.5 | 17 |
| **317** | 36 | < .1 | | 119.5 | | | | |
| **318** | 46 | < .1 | | 208.6 | | | | |
| **319** | 38 | < .1 | | 113.2 | | | | |
| **320** | 54 | < .1 | 11.68 | 165.3 | 2.6 | 0.3 | 7.64 | 13 |
| **321** | 40 | < .1 | | 159.6 | | | | |
| **322** | 42 | < .1 | | 232.1 | | | | |
| **323** | 46 | < .1 | | 162.7 | | | | |
| **324** | 42 | < .1 | | 233.3 | | | | |
| **325** | 49 | < .1 | 12.02 | 152.7 | 2 | 0.4 | 6.38 | 12 |
| **326** | 48 | < .1 | | 124.5 | | | | |
| **327** | 38 | < .1 | | 135.5 | | | | |
| **328** | 54 | < .1 | | 139 | | | | |
| **329** | 47 | < .1 | 10.7 | 144.8 | 2.1 | 0.4 | 6.77 | 14 |
| **330** | 38 | < .1 | | 162.6 | | | | |
| **332** | 52 | < .1 | | 141.4 | | | | |
| **333** | 45 | < .1 | | 144.6 | | | | |
| **334** | 64 | < .1 | 11.79 | 119.2 | 2.1 | 0.4 | 5.13 | 12 |
| **335** | 47 | < .1 | | 145.7 | | | | |
| **336** | 40 | < .1 | | 117.7 | | | | |
| **338** | 57 | < .1 | | 131.2 | | | | |
| **339** | 51 | < .1 | 10.28 | 135.5 | 1.7 | 0.3 | 7.1 | 12 |
| **340** | 48 | < .1 | | 232.4 | | | | |
| **341** | 49 | < .1 | | 131.8 | | | | |
| **342** | 47 | < .1 | 11.82 | 154.9 | 2.1 | 0.3 | 6.76 | 16 |
| **343** | 49 | < .1 | | 163.1 | | | | |
| **344** | 45 | < .1 | | 133.5 | | | | |
| **345** | 49 | < .1 | | 133 | | | | |
| **346** | 80 | < .1 | | 170.1 | | | | |
| **347** | 52 | < .1 | | 95.8 | | | | |
| **348** | 70 | < .1 | 11.31 | 144.9 | 2.2 | 0.4 | 6.38 | 15 |
| **349** | 32 | < .1 | | 172.6 | | | | |
| **350** | 32 | < .1 | | 113.2 | | | | |
| **351** | 44 | < .1 | 11.9 | 216.4 | 2 | 0.4 | 6.53 | 12 |
| **352** | 40 | < .1 | | 133.6 | | | | |
| **353** | 29 | < .1 | | 135.1 | | | | |
| **354** | 35 | < .1 | 10.15 | 122.7 | 2.1 | 0.2 | 7.59 | 15 |
| **355** | 28 | < .1 | | 185.6 | | | | |

| **Element** | Au | Ba | Be | Bi | Ca | Cd | Ce | Co |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.1 | 1 | 1 | 0.1 | 0.01 | 0.1 | 1 | 1 |
| **Samples** | ppm | ppm | ppm | ppm | % | ppm | ppm | ppm |
| **300** | < .1 | 148 | 2 | 0.6 | 1.06 | 7.4 | 73 | 21 |
| **316** | < .1 | 102 | 1 | 0.2 | 2.49 | 0.6 | 55 | 13 |
| **320** | < .1 | 180 | 2 | 0.2 | 3.71 | 1.3 | 60 | 13 |
| **325** | < .1 | 100 | 1 | 0.2 | 6.5 | 1.2 | 56 | 13 |
| **329** | < .1 | 104 | 4 | 0.2 | 5.45 | 1 | 58 | 13 |
| **334** | < .1 | 101 | 1 | 0.1 | 10.64 | 1 | 46 | 13 |
| **339** | < .1 | 142 | 1 | 0.3 | 4.74 | 1.2 | 63 | 12 |
| **342** | < .1 | 102 | 1 | 0.2 | 5.65 | 0.8 | 56 | 14 |
| **348** | < .1 | 112 | 1 | 0.3 | 6.77 | 1.2 | 56 | 15 |
| **351** | < .1 | 98 | 1 | 0.3 | 5.03 | 1.6 | 56 | 17 |
| **354** | < .1 | 138 | 3 | 0.3 | 0.86 | 0.4 | 58 | 13 |

| **Element** | Cr | Cu | Fe | Hf | K | La | Li | Mg |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.1 | 0.1 | 0.01 | 0.1 | 0.01 | 0.1 | 0.1 | 0.01 |
| **Samples** | ppm | ppm | % | ppm | % | ppm | ppm | % |
| **300** | 115.3 | 71.5 | 5.07 | 3 | 2.2 | 40.7 | 87.7 | 0.97 |
| **316** | 114.9 | 50.3 | 3.78 | 2 | 2.2 | 23.6 | 69.2 | 0.84 |
| **320** | 115.9 | 37.9 | 3.26 | 2.3 | 2.11 | 26.5 | 72.5 | 0.85 |
| **325** | 102.8 | 38.4 | 3.21 | 1.7 | 1.83 | 26.9 | 49 | 0.82 |
| **329** | 103.3 | 36.4 | 3.28 | 2.1 | 2.04 | 27 | 47.8 | 0.95 |
| **334** | 80.3 | 33.1 | 3.31 | 1.4 | 1.46 | 20.2 | 34.5 | 1.23 |
| **339** | 108.3 | 35.7 | 2.72 | 2.2 | 2.1 | 27.8 | 56.7 | 0.91 |
| **342** | 99.6 | 37.6 | 3.38 | 2.1 | 1.94 | 26.2 | 52.8 | 0.9 |
| **348** | 83.2 | 36.8 | 3.57 | 1.9 | 1.63 | 25.6 | 47.6 | 0.83 |
| **351** | 85.4 | 47.2 | 3.78 | 1.6 | 1.87 | 31.8 | 43.1 | 0.86 |
| **354** | 106.4 | 33.5 | 3.82 | 2.3 | 2.23 | 30.1 | 79.5 | 0.94 |

| **Element** | Mn | Mo | Na | Nb | Ni | P | Pb | Rb |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 1 | 0.1 | 0.001 | 0.1 | 0.1 | 0.001 | 0.1 | 0.1 |
| **Samples** | ppm | ppm | % | ppm | ppm | % | ppm | ppm |
| **300** | 202 | 32.5 | 0.527 | 14 | 82.3 | 0.084 | 26.5 | 126.5 |
| **316** | 153 | 16.1 | 0.418 | 11.9 | 58.2 | 0.077 | 18.4 | 103 |
| **320** | 101 | 10 | 0.451 | 11.4 | 64 | 0.079 | 18.5 | 106.8 |
| **325** | 102 | 14.9 | 0.371 | 11.4 | 54.7 | 0.078 | 17.1 | 111.7 |
| **329** | 109 | 14.4 | 0.426 | 11.2 | 52.5 | 0.082 | 26.7 | 121.7 |
| **334** | 147 | 18 | 0.308 | 8.9 | 48.6 | 0.074 | 14.1 | 86.4 |
| **339** | 84 | 8.8 | 0.4 | 11.9 | 57.3 | 0.081 | 17.2 | 118.5 |
| **342** | 126 | 18.9 | 0.373 | 11.4 | 51.7 | 0.087 | 15.9 | 116.6 |
| **348** | 114 | 26.6 | 0.328 | 9.5 | 60.1 | 0.072 | 15.5 | 98.3 |
| **351** | 106 | 9.4 | 0.358 | 9.8 | 49.9 | 0.085 | 17.1 | 101.4 |
| **354** | 129 | 5.3 | 0.442 | 12.7 | 42.2 | 0.076 | 17.4 | 108.3 |

| Element | S | Sb | Sc | Sn | Sr | Ta | Th | Ti |
|---|---|---|---|---|---|---|---|---|
| LDL | 0.1 | 0.1 | 1 | 0.1 | 1 | 0.1 | 0.1 | 0.01 |
| Samples | % | ppm | ppm | ppm | ppm | ppm | ppm | % |
| **300** | 2.9 | 3.4 | 15 | 3.4 | 213 | 1 | 12.5 | 0.432 |
| **316** | 2.1 | 2 | 11 | 1.9 | 170 | 0.8 | 8.4 | 0.398 |
| **320** | 1.6 | 1.9 | 13 | 2.3 | 204 | 0.8 | 9.1 | 0.392 |
| **325** | 2.3 | 2.3 | 10 | 1.9 | 305 | 0.7 | 8 | 0.341 |
| **329** | 2.2 | 2 | 10 | 1.9 | 275 | 0.7 | 8 | 0.352 |
| **334** | 2.3 | 2.1 | 8 | 1.4 | 337 | 0.5 | 6.7 | 0.276 |
| **339** | 1.8 | 1.5 | 11 | 1.9 | 214 | 0.8 | 8.9 | 0.371 |
| **342** | 2.4 | 2 | 9 | 1.8 | 224 | 0.7 | 8 | 0.356 |
| **348** | 2.9 | 3.1 | 9 | 1.6 | 227 | 0.6 | 7.9 | 0.294 |
| **351** | 3.1 | 2.2 | 9 | 1.6 | 220 | 0.6 | 8.2 | 0.33 |
| **354** | 2.2 | 1 | 10 | 2.2 | 170 | 0.8 | 8.2 | 0.417 |

***Analysis: GROUP 4B - REE - 0.200 GM***

| **Element** | **U** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ce** | **Co** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **1** | **0.1** | **0.1** | **1** | **0.1** | **0.5** | **0.5** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **300** | 9.8 | 411 | 1.7 | 23.5 | 911 | 84.4 | 82.4 | 19.1 |
| **316** | 5.1 | 276 | 1.1 | 15.8 | 190 | 62.4 | 75.9 | 14.5 |
| **320** | 5.2 | 282 | 1 | 18 | 184 | 60.7 | 76 | 14.3 |
| **325** | 5.6 | 242 | 1 | 18.6 | 168 | 58.5 | 67.1 | 13 |
| **329** | 5.6 | 229 | 0.9 | 17.6 | 161 | 59.5 | 62.7 | 12.4 |
| **334** | 6.6 | 216 | 1 | 16.8 | 132 | 45.6 | 53.5 | 11.5 |
| **339** | 4.8 | 281 | 0.8 | 17.9 | 162 | 62.1 | 69 | 12.7 |
| **342** | 6.1 | 232 | 1.1 | 18.4 | 169 | 61.4 | 64.8 | 14.2 |
| **348** | 8.9 | 307 | 0.8 | 17.3 | 160 | 54.9 | 61.9 | 13.4 |
| **351** | 4.7 | 235 | 1 | 14.5 | 227 | 55.5 | 61.5 | 17.5 |
| **354** | 4.4 | 229 | 1.2 | 13.8 | 134 | 68.2 | 77.2 | 13.7 |

| Element | Cs | Dy | Er | Eu | Ga | Gd | Hf | Ho |
|---|---|---|---|---|---|---|---|---|
| LDL | 0.1 | 0.05 | 0.05 | 0.05 | 0.5 | 0.05 | 0.5 | 0.05 |
| Samples | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm |
| **300** | 10.3 | 4.69 | 3.09 | 1.28 | 23 | 4.79 | 4 | 1.02 |
| **316** | 8.8 | 4.29 | 2.5 | 1.26 | 20.2 | 5.29 | 3.5 | 0.91 |
| **320** | 9 | 4.56 | 2.59 | 1.43 | 19.8 | 4.85 | 3.7 | 0.97 |
| **325** | 7.2 | 4.09 | 2.42 | 1.15 | 16.7 | 4.1 | 3.2 | 0.85 |
| **329** | 7.5 | 3.53 | 2.05 | 1.07 | 16.9 | 4.19 | 3.4 | 0.73 |
| **334** | 5.3 | 3.25 | 1.94 | 1.05 | 13.4 | 3.84 | 2.7 | 0.68 |
| **339** | 7.6 | 3.71 | 2.13 | 1.25 | 17.9 | 4.16 | 4 | 0.77 |
| **342** | 6.9 | 3.62 | 2.17 | 1.12 | 16.9 | 4.47 | 3.3 | 0.73 |
| **348** | 5.9 | 3.9 | 1.94 | 1.1 | 16.5 | 3.71 | 3.2 | 0.79 |
| **351** | 8.2 | 3.57 | 2.02 | 0.98 | 16.7 | 4.6 | 3 | 0.77 |
| **354** | 10.3 | 4.32 | 2.54 | 1.12 | 22.7 | 5.07 | 4 | 0.9 |

| **Element** | La | Lu | Nb | Nd | Pr | Sn | Rb | Sm |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.5 | 0.01 | 0.5 | 0.4 | 0.02 | 1 | 0.5 | 0.1 |
| **Samples** | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm |
| **300** | 41 | 0.48 | 17 | 32.5 | 9.22 | 1 | 133 | 6 |
| **316** | 37.4 | 0.37 | 17.2 | 36.6 | 9.21 | 1 | 142.7 | 6.3 |
| **320** | 37.7 | 0.38 | 16.8 | 36.8 | 9.15 | 1 | 138.2 | 6.3 |
| **325** | 33.4 | 0.32 | 15.1 | 30.4 | 8.06 | < 1 | 118.5 | 5.6 |
| **329** | 33 | 0.33 | 15.5 | 29.5 | 7.55 | 1 | 120.4 | 5.2 |
| **334** | 27 | 0.27 | 12 | 24.9 | 6.54 | < 1 | 86 | 4.4 |
| **339** | 35.7 | 0.31 | 15.7 | 31 | 8.4 | < 1 | 129.3 | 5.6 |
| **342** | 33.8 | 0.32 | 14.9 | 28.8 | 7.81 | < 1 | 117.2 | 5 |
| **348** | 30.1 | 0.3 | 12.5 | 30.5 | 7.54 | < 1 | 100.9 | 5.2 |
| **351** | 32.9 | 0.34 | 13.4 | 29.5 | 7.53 | < 1 | 117.7 | 5.6 |
| **354** | 41.1 | 0.42 | 17.2 | 35.3 | 9.38 | 2 | 147.9 | 6.4 |

| **Element** | Sr | Ta | Tb | Th | Tm | U | V | W |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.5 | 0.1 | 0.01 | 0.1 | 0.05 | 0.1 | 5 | 0.1 |
| **Samples** | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm |
| **300** | 255.4 | 1.1 | 0.83 | 14.9 | 0.49 | 10.5 | 389 | 2.2 |
| **316** | 201.8 | 1.1 | 0.8 | 11.7 | 0.42 | 6.9 | 280 | 3.5 |
| **320** | 227.4 | 0.9 | 0.86 | 10.7 | 0.44 | 6.9 | 284 | 1.7 |
| **325** | 353 | 0.9 | 0.77 | 10.5 | 0.39 | 7.1 | 263 | 1.3 |
| **329** | 300.1 | 0.8 | 0.68 | 9.2 | 0.34 | 7 | 231 | 1.3 |
| **334** | 383.5 | 0.7 | 0.63 | 8.3 | 0.32 | 8.1 | 205 | 0.9 |
| **339** | 228.2 | 0.9 | 0.73 | 10.7 | 0.36 | 5.7 | 293 | 1.2 |
| **342** | 252.3 | 0.9 | 0.78 | 9.3 | 0.36 | 7.8 | 235 | 1.2 |
| **348** | 262.9 | 0.9 | 0.71 | 9.3 | 0.3 | 10.7 | 320 | 1.4 |
| **351** | 214.9 | 0.8 | 0.63 | 10.1 | 0.33 | 5.9 | 248 | 1.2 |
| **354** | 193.2 | 1.1 | 0.77 | 12.8 | 0.41 | 6.3 | 245 | 1.5 |

***Analysis: GROUP 4A - 0.200 GM***

| **Element** | **Y** | **Yb** | **Zr** | **Al2O3** | **Ba** | **CaO** | **Cr2O3** | **Cr2O3** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.05** | **0.5** | **0.03** | **5** | **0.01** | **0.001** | **0.001** |
| **Samples** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **%** | **%** | **%** |
| **300** | 31 | 3.07 | 141.5 | 16.59 | 998 | 1.56 | 0.012 | |
| **316** | 25.9 | 2.41 | 120.2 | 15.33 | 1226 | 3.78 | 0.013 | 0.0154 |
| **320** | 27 | 2.85 | 122 | 15.06 | 1063 | 5.76 | 0.012 | 0.015 |
| **325** | 24.7 | 2.5 | 114.5 | 12.95 | 1069 | 10.37 | 0.013 | 0.0135 |
| **329** | 21.7 | 2.25 | 107.5 | 13.34 | 917 | 8.47 | 0.014 | 0.0134 |
| **334** | 20.4 | 2.03 | 92.5 | 10.37 | 1036 | 17.25 | 0.009 | 0.0102 |
| **339** | 22.8 | 2.16 | 118.9 | 14.09 | 934 | 7.3 | 0.011 | 0.0146 |
| **342** | 22.9 | 2.32 | 105.9 | 13.8 | 911 | 8.93 | 0.013 | 0.0129 |
| **348** | 21.9 | 2.07 | 102.6 | 13.3 | 826 | 11.06 | 0.009 | 0.0111 |
| **351** | 23.3 | 2.13 | 102.5 | 13.48 | 829 | 8.51 | 0.012 | 0.012 |
| **354** | 28.5 | 2.65 | 127.9 | 16.74 | 906 | 1.57 | 0.015 | 0.0145 |

| **Element** | Fe2O3 | K2O | LOI | MgO | MnO | Na2O | Ni | P2O5 |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.04 | 0.04 | 0.1 | 0.01 | 0.01 | 0.01 | 30 | 0.01 |
| **Samples** | % | % | % | % | % | % | ppm | % |
| **300** | 6.67 | 2.53 | 15.2 | 1.73 | 0.02 | 0.71 | 70 | 0.18 |
| **316** | 5.28 | 2.86 | 13.5 | 1.57 | 0.02 | 0.6 | 64 | 0.2 |
| **320** | 4.5 | 2.77 | 13.7 | 1.56 | 0.01 | 0.58 | 70 | 0.19 |
| **325** | 4.6 | 2.45 | 16.6 | 1.55 | 0.01 | 0.49 | 50 | 0.18 |
| **329** | 4.63 | 2.64 | 14.6 | 1.77 | 0.01 | 0.6 | 56 | 0.2 |
| **334** | 4.39 | 1.95 | 20.6 | 2.22 | 0.02 | 0.49 | 36 | 0.2 |
| **339** | 3.83 | 2.69 | 14.3 | 1.68 | 0.01 | 0.55 | 45 | 0.21 |
| **342** | 4.74 | 2.54 | 16.5 | 1.67 | 0.02 | 0.55 | 55 | 0.22 |
| **348** | 4.99 | 2.21 | 19.4 | 1.57 | 0.01 | 0.49 | 63 | 0.2 |
| **351** | 5.47 | 2.49 | 16.6 | 1.64 | 0.01 | 0.53 | 42 | 0.23 |
| **354** | 5.44 | 2.95 | 11.5 | 1.78 | 0.01 | 0.61 | 56 | 0.19 |

|  |  |  |  |  |  |  | ***Analysis: CO2*** |  |
|---|---|---|---|---|---|---|---|---|
| **Element** | **Sc** | **SiO2** | **TiO2** | **TOT/C** | **TOT/S** | **SUM** | **C/ORG** | **C/GRA** |
| **LDL** | **1** | **0.02** | **0.01** | **0.01** | **0.01** |  |  |  |
| **Samples** | **ppm** | **%** | **%** | **%** | **%** | **%** | **%** | **%** |
| **300** | 16 | 53.6 | 0.69 | 5.76 | 3.32 | 99.5 | 5.12 | 0.07 |
| **316** | 14 | 55.77 | 0.69 | 4.15 | 2.66 | 99.75 | 3.3 | 0.05 |
| **320** | 17 | 54.82 | 0.68 | 4.53 | 2.01 | 99.77 | 3.33 | 0.03 |
| **325** | 13 | 49.84 | 0.6 | 6.44 | 2.61 | 99.79 | 4.27 | 0.05 |
| **329** | 11 | 52.79 | 0.6 | 4.89 | 2.5 | 99.78 | 3.03 | 0.04 |
| **334** | 9 | 41.74 | 0.47 | 7.67 | 2.6 | 99.84 | 4.05 | 0.03 |
| **339** | 12 | 54.32 | 0.63 | 5.1 | 2.11 | 99.74 | 3.52 | 0.03 |
| **342** | 12 | 50.12 | 0.61 | 5.99 | 2.9 | 99.82 | 4.05 | 0.06 |
| **348** | 11 | 45.91 | 0.53 | 8.33 | 3.4 | 99.77 | 6.07 | 0.02 |
| **351** | 12 | 50.08 | 0.59 | 6.39 | 3.38 | 99.74 | 4.64 | 0.11 |
| **354** | 15 | 57.72 | 0.75 | 3.12 | 2.67 | 99.39 | 2.63 | 0.06 |

| **Element** | **CO2** | **SO4** |
|---|---|---|
| **LDL** |  |  |
| **Samples** | **%** | **%** |
| **300** | 2.1 | 1.58 |
| **316** | 2.96 | 2.53 |
| **320** | 4.29 | 2.24 |
| **325** | 7.77 | 2.97 |
| **329** | 6.67 | 2.71 |
| **334** | 13.18 | 3.17 |
| **339** | 5.71 | 1.92 |
| **342** | 6.86 | 3.17 |
| **348** | 8.23 | 3.4 |
| **351** | 6.01 | 2.72 |
| **354** | 1.59 | 1.39 |

| **Samples** | **Hole** | **Latitude** | **Longitude** | **From (m)** | **To (m)** | **Analysis Date** |
|---|---|---|---|---|---|---|
| **356** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1803.410 | 1803.430 | Dec. 2003 |
| **357** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1804.400 | 1804.420 | Dec. 2003 |
| **358** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1805.440 | 1805.460 | Dec. 2003 |
| **359** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1806.360 | 1806.420 | Dec. 2003 |
| **360** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1807.450 | 1807.520 | Dec. 2003 |
| **361** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1807.620 | 1807.640 | Dec. 2003 |
| **362** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1808.320 | 1808.380 | Dec. 2003 |
| **363** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1809.360 | 1809.390 | Dec. 2003 |
| **364** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1810.360 | 1810.420 | Dec. 2003 |
| **365** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1811.360 | 1811.425 | Dec. 2003 |
| **366** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1812.300 | 1812.340 | Dec. 2003 |
| **367** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1813.340 | 1813.380 | Dec. 2003 |
| **368** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1814.310 | 1814.360 | Dec. 2003 |
| **369** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1815.250 | 1815.280 | Dec. 2003 |
| **370** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1812.300 | 1812.340 | Dec. 2003 |
| **371** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1813.340 | 1813.380 | Dec. 2003 |
| **372** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1814.310 | 1814.360 | Dec. 2003 |
| **373** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1819.145 | 1819.215 | Dec. 2003 |
| **374** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1812.300 | 1812.340 | Dec. 2003 |
| **375** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1813.340 | 1813.380 | Dec. 2003 |
| **376** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1822.105 | 1822.175 | Dec. 2003 |
| **377** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2124.510 | 2124.560 | Dec. 2003 |
| **378** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2125.485 | 2125.525 | Dec. 2003 |
| **379** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2126.455 | 2126.515 | Dec. 2003 |
| **380** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2127.690 | 2127.760 | Dec. 2003 |
| **381** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2128.665 | 2128.725 | Dec. 2003 |
| **382** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2129.700 | 2129.750 | Dec. 2003 |
| **383** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2130.720 | 2130.790 | Dec. 2003 |
| **384** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2131.795 | 2131.845 | Dec. 2003 |
| **385** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2132.590 | 2132.650 | Dec. 2003 |
| **386** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2133.560 | 2133.610 | Dec. 2003 |
| **387** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2134.550 | 2134.600 | Dec. 2003 |
| **388** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2135.555 | 2135.610 | Dec. 2003 |
| **389** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2136.630 | 2136.680 | Dec. 2003 |
| **390** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2137.545 | 2137.605 | Dec. 2003 |
| **391** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2138.555 | 2138.615 | Dec. 2003 |
| **392** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2139.570 | 2139.640 | Dec. 2003 |
| **393** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2140.605 | 2140.650 | Dec. 2003 |
| **394** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2142.600 | 2142.640 | Dec. 2003 |
| **395** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2143.340 | 2143.390 | Dec. 2003 |
| **396** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2144.345 | 2144.390 | Dec. 2003 |
| **399** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2146.290 | 2146.335 | Dec. 2003 |
| **400** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2147.310 | 2147.360 | Dec. 2003 |
| **401** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2148.285 | 2148.350 | Dec. 2003 |
| **402** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2149.340 | 2148.390 | Dec. 2003 |
| **403** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2150.300 | 2150.350 | Dec. 2003 |
| **404** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2151.315 | 2151.370 | Dec. 2003 |
| **405** | 00/10-31-054-18W5/0 | 53.711393 | -116.636386 | 2152.300 | 2151.360 | Dec. 2003 |

| Samples | Probability of Fm | Formation | Sample Description |
|---|---|---|---|
| 356 | Probable | Second White Specks | Dk grey shale fragments, minor silt |
| 357 | Probable | Second White Specks | Dk grey shale, broken fragments, some silt |
| 358 | Probable | Second White Specks | Dk grey shale, minor silt and micas |
| 359 | Probable | Second White Specks | Dk grey shale, some silt, organic fragments |
| 360 | Probable | Second White Specks | Dk grey shale, some silt, smooth |
| 361 | Probable | Second White Specks | Pyrite/vitreous black |
| 362 | Probable | Second White Specks | Dk grey shale |
| 363 | Probable | Second White Specks | Broken fragments of shale, smooth, minor silt, fish fragments |
| 364 | Probable | Second White Specks | Dk grey shale, minor silt |
| 365 | Probable | Second White Specks | Dk grey shale, minor silt |
| 366 | Known | Second White Specks | Broken fragments of shale, some silt |
| 367 | Unknown | Second White Specks | Broken fragments of shale, micas |
| 368 | Unknown | Second White Specks | Dk grey shale, micas, wisps of silt |
| 369 | Unknown | Second White Specks | Dk grey shale, micas, wisps of silt |
| 370 | Unknown | Second White Specks | Dk grey shale, micas, some silt |
| 371 | Unknown | Second White Specks | Dk grey shale, micas |
| 372 | Unknown | Second White Specks | Dk grey shale, micas |
| 373 | Unknown | Second White Specks | Dk grey shale, shelly fragments, silty wisps |
| 374 | Unknown | Second White Specks | Dk grey shale, smooth, micas, some shells |
| 375 | Unknown | Second White Specks | Dk grey shale, fish fragments, micas |
| 376 | Unknown | Second White Specks | Dk grey shale, organic debris, smooth, shelly fragments, micas |
| 377 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, some silty pockets/lams |
| 378 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silt lams/pockets, smooth |
| 379 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silty lams |
| 380 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silty lams |
| 381 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silty/sandy lams/pockets |
| 382 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, micas, silt, fish fragments |
| 383 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silty lams |
| 384 | Unknown | Belle Fourche (or underlying shale) | Broken fragments of shale, silty pockets |
| 385 | Unknown | Belle Fourche (or underlying shale) | Broken fragments of shale, silt pockets/lams |
| 386 | Unknown | Belle Fourche (or underlying shale) | Broken fragments of shale, silt, micas |
| 387 | Unknown | Belle Fourche (or underlying shale) | Broken fragments of shale, silty lams, organic fragments |
| 388 | Unknown | Belle Fourche (or underlying shale) | Broken fragments of shale, shelly debris, minor silt |
| 389 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, shelly fragments, fish fragments, micas, silty lams |
| 390 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, some shelly debris |
| 391 | Unknown | Belle Fourche (or underlying shale) | Broken fragments of shale, fish fragments |
| 392 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, small amount of silt, fish debris |
| 393 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silty lams, shelly debris |
| 394 | Unknown | Belle Fourche (or underlying shale) | Broken fragments of shale, micas, a little silt |
| 395 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silt lams |
| 396 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silt, some fish fragments |
| 399 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, some silt |
| 400 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, some silt, some black organic fragments |
| 401 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, silt, black organic remains |
| 402 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, smooth, some silt, some black organic remains |
| 403 | Unknown | Belle Fourche (or underlying shale) | Broken fragments of shale, some silt, some fish fragments |
| 404 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, smooth, some silt, some fish remains |
| 405 | Unknown | Belle Fourche (or underlying shale) | Dk grey shale, smooth, some silt, some black organic remains |

***Analysis: GROUP 1F1 - 1.00 GM***

| **Element** | **Ag** | **Al** | **As** | **Au** | **B** | **Ba** | **Be** | **Bi** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** | **0.1** | **0.02** |
| **Samples** | **ppb** | **%** | **ppm** | **ppb** | **ppm** | **ppm** | **ppm** | **ppm** |
| **356** | 279 | 0.79 | 23.8 | 0.6 | 11 | 75.1 | 0.8 | 0.3 |
| **357** | 278 | 0.74 | 27.3 | 0.4 | 5 | 39.8 | | 0.25 |
| **358** | 288 | 0.76 | 19.1 | < .2 | 5 | 46.2 | | 0.26 |
| **359** | 277 | 0.74 | 23.1 | 0.4 | 7 | 40.7 | | 0.25 |
| **360** | 298 | 0.72 | 26.4 | 0.6 | 10 | 74.4 | 0.6 | 0.33 |
| **361** | 245 | 1.06 | 28.2 | < .2 | 8 | 44.1 | | 0.87 |
| **362** | 266 | 0.65 | 25 | < .2 | 6 | 60 | | 0.23 |
| **363** | 285 | 0.85 | 27 | < .2 | 8 | 47 | | 0.31 |
| **364** | 261 | 0.8 | 24.3 | 0.2 | 9 | 48.8 | | 0.25 |
| **365** | 269 | 0.8 | 25.3 | 0.2 | 10 | 75.1 | 0.7 | 0.27 |
| **366** | 277 | 0.77 | 26.4 | 0.9 | 6 | 47.4 | | 0.24 |
| **367** | 244 | 0.79 | 26.6 | < .2 | 9 | 44.2 | | 0.25 |
| **368** | 263 | 0.77 | 25.2 | < .2 | 7 | 47.9 | | 0.26 |
| **369** | 281 | 0.72 | 26.8 | 0.2 | 10 | 71.2 | 0.9 | 0.25 |
| **370** | 289 | 0.78 | 30.6 | 0.5 | 8 | 45.4 | | 0.27 |
| **371** | 281 | 0.79 | 28.1 | 0.6 | 7 | 50.7 | | 0.26 |
| **372** | 314 | 0.79 | 34.4 | < .2 | 7 | 41.3 | | 0.48 |
| **373** | 308 | 0.74 | 29.4 | 0.4 | 10 | 62.7 | 0.9 | 0.27 |
| **374** | 298 | 0.83 | 24.8 | 0.2 | 7 | 46.4 | | 0.27 |
| **375** | 286 | 0.73 | 25.1 | < .2 | 10 | 53.5 | | 0.23 |
| **376** | 315 | 0.73 | 28.3 | < .2 | 10 | 67.9 | 0.8 | 0.26 |
| **377** | 359 | 0.66 | 31.5 | < .2 | 9 | 33 | | 0.27 |
| **378** | 378 | 0.65 | 31.8 | 0.3 | 9 | 36.6 | | 0.26 |
| **379** | 321 | 0.59 | 33.2 | 0.4 | 6 | 51.1 | | 0.22 |
| **380** | 310 | 0.6 | 32.6 | 0.5 | 7 | 46.4 | | 0.23 |
| **381** | 314 | 0.55 | 28.4 | 0.4 | 8 | 48 | | 0.21 |
| **382** | 331 | 0.62 | 37.3 | 0.3 | 10 | 36.7 | | 0.28 |
| **383** | 359 | 0.58 | 29.7 | 0.2 | 8 | 40.4 | | 0.23 |
| **384** | 314 | 0.64 | 35.8 | 0.2 | 9 | 40.6 | | 0.26 |
| **385** | 392 | 0.65 | 37 | 0.4 | 7 | 42.6 | | 0.26 |
| **386** | 207 | 0.95 | 20.2 | 0.5 | 13 | 81.1 | | 0.28 |
| **387** | 182 | 0.91 | 16.4 | 0.2 | 10 | 53.9 | | 0.28 |
| **388** | 161 | 0.86 | 16.8 | 0.4 | 7 | 56 | | 0.24 |
| **389** | 193 | 0.88 | 18 | 0.4 | 10 | 52.6 | | 0.25 |
| **390** | 214 | 0.82 | 27.1 | 0.4 | 9 | 52.1 | | 0.25 |
| **391** | 210 | 0.85 | 23.4 | 0.2 | 8 | 58.7 | | 0.26 |
| **392** | 222 | 0.79 | 28.9 | < .2 | 7 | 48.9 | | 0.26 |
| **393** | 348 | 0.64 | 38.5 | 0.3 | 7 | 39.7 | | 0.27 |
| **394** | 288 | 0.81 | 28.4 | 0.2 | 6 | 41.6 | | 0.25 |
| **395** | 273 | 0.84 | 29.5 | 0.2 | 6 | 41.8 | | 0.21 |
| **396** | 183 | 0.8 | 20.8 | 0.2 | 8 | 45 | | 0.27 |
| **399** | 199 | 0.95 | 20.3 | < .2 | 7 | 41 | | 0.24 |
| **400** | 223 | 0.9 | 21.5 | 0.2 | 6 | 42.5 | | 0.27 |
| **401** | 215 | 0.85 | 20.8 | < .2 | 7 | 42.6 | | 0.23 |
| **402** | 223 | 0.92 | 21.6 | 0.5 | 9 | 43 | | 0.25 |
| **403** | 258 | 0.95 | 20.1 | 0.5 | 9 | 46.1 | | 0.25 |
| **404** | 195 | 0.95 | 21.7 | < .2 | 6 | 47.6 | | 0.28 |
| **405** | 163 | 0.92 | 22.1 | 0.2 | 6 | 41.2 | | 0.26 |

| **Element** | **Ca** | **Cd** | **Ce** | **Co** | **Cr** | **Cs** | **Cu** | **Fe** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **0.01** | **0.1** | **0.1** | **0.5** | **0.02** | **0.01** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **356** | 1.9 | 0.67 | 8 | 11.3 | 13.6 | 1.65 | 34.6 | 2.42 |
| **357** | 2.84 | 0.71 |  | 12.7 | 13.5 |  | 32.73 | 2.71 |
| **358** | 2.11 | 0.75 |  | 10.7 | 13.3 |  | 32.22 | 2.38 |
| **359** | 2.77 | 0.66 |  | 11.8 | 14 |  | 31.93 | 2.61 |
| **360** | 2.5 | 0.67 | 10.1 | 13.2 | 11.9 | 1.76 | 37.23 | 2.48 |
| **361** | 1.28 | 0.51 |  | 10.6 | 11.6 |  | 25.21 | 2.65 |
| **362** | 5.4 | 0.67 |  | 11.8 | 15.1 |  | 29.49 | 3.29 |
| **363** | 1.89 | 0.79 |  | 12 | 14 |  | 33.82 | 2.55 |
| **364** | 2.4 | 0.79 |  | 11.6 | 14.2 |  | 30.91 | 2.52 |
| **365** | 2.73 | 0.79 | 10.8 | 12.7 | 12.7 | 1.66 | 33.95 | 2.46 |
| **366** | 2.69 | 0.78 |  | 12.2 | 14.4 |  | 31.24 | 2.74 |
| **367** | 2.61 | 0.69 |  | 11.2 | 14.2 |  | 29.67 | 2.71 |
| **368** | 2.42 | 0.83 |  | 11.1 | 13.5 |  | 30.3 | 2.54 |
| **369** | 3.13 | 0.89 | 8.5 | 12.2 | 11.8 | 1.58 | 33.39 | 2.57 |
| **370** | 2.83 | 0.8 |  | 12.4 | 14.2 |  | 35.03 | 2.73 |
| **371** | 2.06 | 1.05 |  | 11.5 | 13.5 |  | 32.4 | 2.69 |
| **372** | 3.11 | 0.77 |  | 12.4 | 14.1 |  | 34.31 | 3.1 |
| **373** | 2.69 | 0.74 | 8.2 | 13.6 | 11.6 | 1.52 | 37.53 | 2.63 |
| **374** | 2.16 | 0.87 |  | 12.4 | 13.9 |  | 32.83 | 2.61 |
| **375** | 4.22 | 1 |  | 11.5 | 13.2 |  | 31.14 | 2.51 |
| **376** | 4.34 | 0.83 | 9.3 | 13.3 | 12.4 | 1.37 | 35.5 | 2.69 |
| **377** | 3.53 | 1.28 |  | 15.3 | 11.3 |  | 39.34 | 3.26 |
| **378** | 3.33 | 1.21 |  | 15.3 | 10.5 |  | 38.78 | 3.22 |
| **379** | 4.61 | 1.1 |  | 14.4 | 9.6 |  | 34.88 | 2.73 |
| **380** | 5.27 | 1.43 |  | 13.9 | 11.1 |  | 34.12 | 3.04 |
| **381** | 5.46 | 1.15 |  | 13.6 | 9.8 |  | 34.46 | 2.61 |
| **382** | 3.5 | 1.29 |  | 18 | 9.7 |  | 39.53 | 2.91 |
| **383** | 4.4 | 1.66 |  | 16.2 | 9.9 |  | 37.76 | 2.61 |
| **384** | 2.98 | 2.08 |  | 14.6 | 11.1 |  | 36.34 | 2.85 |
| **385** | 3.56 | 1.87 |  | 17.3 | 11.1 |  | 39.87 | 2.92 |
| **386** | 1.8 | 0.56 |  | 14.3 | 17.5 |  | 30.57 | 2.93 |
| **387** | 1.36 | 0.69 |  | 12.2 | 15.2 |  | 28.87 | 2.57 |
| **388** | 1.96 | 0.41 |  | 11.2 | 14.9 |  | 26.46 | 2.5 |
| **389** | 1.97 | 0.35 |  | 12.4 | 15.9 |  | 28.27 | 2.65 |
| **390** | 1.88 | 0.65 |  | 12.7 | 15.6 |  | 32.65 | 2.6 |
| **391** | 2.41 | 0.47 |  | 13.3 | 15 |  | 30.44 | 2.67 |
| **392** | 2.05 | 0.63 |  | 13.2 | 14.3 |  | 32.82 | 2.72 |
| **393** | 3.15 | 1.06 |  | 16.5 | 10.9 |  | 40.41 | 3 |
| **394** | 2.56 | 1.4 |  | 16.3 | 13.7 |  | 40.61 | 3.35 |
| **395** | 2.96 | 1.61 |  | 15.8 | 13.7 |  | 34.42 | 3.44 |
| **396** | 1.91 | 0.67 |  | 11.8 | 13.2 |  | 25.87 | 2.78 |
| **399** | 1.98 | 0.64 |  | 13 | 14.3 |  | 29.18 | 3.21 |
| **400** | 1.46 | 0.59 |  | 12.9 | 14.1 |  | 30.73 | 3.12 |
| **401** | 1.6 | 0.65 |  | 13.2 | 13.8 |  | 33.62 | 2.95 |
| **402** | 1.82 | 0.85 |  | 13.1 | 14.6 |  | 30.72 | 3.1 |
| **403** | 1.56 | 0.67 |  | 13.8 | 15.3 |  | 35.15 | 3.08 |
| **404** | 1.36 | 0.7 |  | 13.2 | 15.1 |  | 29.88 | 2.97 |
| **405** | 1.69 | 0.39 |  | 12.8 | 16 |  | 26.99 | 3.07 |

| **Element**<br>**LDL**<br>**Samples** | **Ga**<br>**0.1**<br>**ppm** | **Ge**<br>**0.1**<br>**ppm** | **Hf**<br>**0.02**<br>**ppm** | **Hg**<br>**5**<br>**ppb** | **In**<br>**0.02**<br>**ppm** | **K**<br>**0.01**<br>**%** | **La**<br>**0.5**<br>**ppm** | **Li**<br>**0.1**<br>**ppm** |
|---|---|---|---|---|---|---|---|---|
| **356** | 2.4 | < .1 | 0.05 | 84 | 0.05 | 0.24 | 3.5 | 14.2 |
| **357** | 2.4 | | | 102 | | 0.23 | 3.5 | |
| **358** | 2.4 | | | 73 | | 0.22 | 3.3 | |
| **359** | 2.3 | | | 75 | | 0.22 | 3.3 | |
| **360** | 2.5 | < .1 | 0.05 | 90 | 0.05 | 0.21 | 4.6 | 13.4 |
| **361** | 2.8 | | | 60 | | 0.23 | 7.8 | |
| **362** | 2.2 | | | 77 | | 0.22 | 4 | |
| **363** | 2.7 | | | 97 | | 0.26 | 3.3 | |
| **364** | 2.5 | | | 88 | | 0.24 | 3.4 | |
| **365** | 2.8 | < .1 | 0.04 | 80 | 0.04 | 0.24 | 4.6 | 12.4 |
| **366** | 2.4 | | | 93 | | 0.24 | 3.3 | |
| **367** | 2.5 | | | 79 | | 0.25 | 3.2 | |
| **368** | 2.3 | | | 80 | | 0.23 | 3.1 | |
| **369** | 2.2 | < .1 | 0.05 | 71 | 0.04 | 0.2 | 3.4 | 13 |
| **370** | 2.6 | | | 92 | | 0.25 | 3.5 | |
| **371** | 2.8 | | | 70 | | 0.24 | 3.4 | |
| **372** | 2.5 | | | 87 | | 0.24 | 3.8 | |
| **373** | 2.3 | < .1 | 0.05 | 84 | 0.04 | 0.22 | 3.3 | 13.2 |
| **374** | 2.6 | | | 79 | | 0.25 | 3 | |
| **375** | 2.3 | | | 73 | | 0.24 | 3.4 | |
| **376** | 2.4 | < .1 | 0.06 | 97 | 0.04 | 0.23 | 3.8 | 12.7 |
| **377** | 2.2 | | | 100 | | 0.22 | 3.2 | |
| **378** | 2 | | | 114 | | 0.23 | 3.1 | |
| **379** | 1.7 | | | 107 | | 0.19 | 3.1 | |
| **380** | 1.6 | | | 99 | | 0.17 | 4 | |
| **381** | 1.6 | | | 88 | | 0.19 | 3.6 | |
| **382** | 1.7 | | | 102 | | 0.2 | 3.1 | |
| **383** | 1.7 | | | 110 | | 0.19 | 3.4 | |
| **384** | 1.9 | | | 117 | | 0.2 | 3.2 | |
| **385** | 1.8 | | | 95 | | 0.22 | 3.3 | |
| **386** | 2.7 | | | 69 | | 0.25 | 3.2 | |
| **387** | 2.7 | | | 89 | | 0.22 | 2.8 | |
| **388** | 2.3 | | | 81 | | 0.22 | 2.9 | |
| **389** | 2.3 | | | 68 | | 0.23 | 2.9 | |
| **390** | 2.3 | | | 72 | | 0.25 | 2.9 | |
| **391** | 2.3 | | | 70 | | 0.23 | 3.1 | |
| **392** | 2.3 | | | 77 | | 0.23 | 3 | |
| **393** | 1.9 | | | 114 | | 0.21 | 3.3 | |
| **394** | 2.2 | | | 84 | | 0.22 | 3.4 | |
| **395** | 2.2 | | | 68 | | 0.24 | 3.6 | |
| **396** | 2.2 | | | 72 | | 0.22 | 3.2 | |
| **399** | 2.6 | | | 95 | | 0.27 | 3.3 | |
| **400** | 2.5 | | | 78 | | 0.24 | 3 | |
| **401** | 2.4 | | | 91 | | 0.24 | 3.2 | |
| **402** | 2.4 | | | 87 | | 0.24 | 3.2 | |
| **403** | 2.6 | | | 73 | | 0.25 | 3.3 | |
| **404** | 2.6 | | | 69 | | 0.24 | 3 | |
| **405** | 2.5 | | | 71 | | 0.24 | 2.7 | |

| **Element** | **Mg** | **Mn** | **Mo** | **Na** | **Nb** | **Ni** | **P** | **Pb** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **1** | **0.01** | **0.001** | **0.02** | **0.1** | **0.001** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** |
| **356** | 0.39 | 65 | 7.1 | 0.213 | 0.04 | 45.3 | 0.063 | 16.93 |
| **357** | 0.47 | 96 | 8.21 | 0.208 | | 39.7 | 0.063 | 14.6 |
| **358** | 0.45 | 77 | 6.02 | 0.211 | | 40.9 | 0.06 | 15.72 |
| **359** | 0.48 | 83 | 4.61 | 0.213 | | 35 | 0.062 | 14.76 |
| **360** | 0.44 | 69 | 9.82 | 0.216 | 0.03 | 55.1 | 0.07 | 19.12 |
| **361** | 0.35 | 79 | 10.12 | 0.249 | | 33.5 | 0.063 | 26.94 |
| **362** | 1.4 | 194 | 12.51 | 0.186 | | 40.6 | 0.064 | 13.14 |
| **363** | 0.43 | 75 | 10.05 | 0.25 | | 48.4 | 0.065 | 17.59 |
| **364** | 0.44 | 80 | 11.38 | 0.224 | | 47.2 | 0.059 | 15.1 |
| **365** | 0.44 | 83 | 10.44 | 0.216 | 0.04 | 51 | 0.074 | 16.51 |
| **366** | 0.5 | 82 | 11.45 | 0.216 | | 47.5 | 0.064 | 17.63 |
| **367** | 0.44 | 77 | 10.75 | 0.222 | | 46 | 0.06 | 14.79 |
| **368** | 0.38 | 75 | 9.78 | 0.231 | | 46.6 | 0.062 | 14.49 |
| **369** | 0.48 | 70 | 12.74 | 0.202 | 0.02 | 51.5 | 0.067 | 15.32 |
| **370** | 0.41 | 91 | 12.69 | 0.242 | | 48.2 | 0.067 | 14.76 |
| **371** | 0.44 | 73 | 8.1 | 0.222 | | 45.9 | 0.062 | 15.12 |
| **372** | 0.59 | 96 | 14.63 | 0.213 | | 44 | 0.072 | 15.83 |
| **373** | 0.44 | 79 | 11.53 | 0.212 | 0.02 | 47.8 | 0.068 | 15.21 |
| **374** | 0.43 | 67 | 9.72 | 0.238 | | 51.6 | 0.061 | 15.19 |
| **375** | 0.43 | 73 | 13.11 | 0.207 | | 49.3 | 0.065 | 13.4 |
| **376** | 0.5 | 80 | 15.1 | 0.198 | 0.02 | 52.6 | 0.07 | 14.8 |
| **377** | 0.5 | 87 | 21.78 | 0.188 | | 54.7 | 0.068 | 15.73 |
| **378** | 0.55 | 94 | 19.58 | 0.181 | | 49.9 | 0.068 | 15.23 |
| **379** | 0.44 | 92 | 21.52 | 0.157 | | 50 | 0.068 | 12.77 |
| **380** | 0.76 | 89 | 16.88 | 0.142 | | 58 | 0.089 | 12.94 |
| **381** | 0.65 | 101 | 15.33 | 0.148 | | 40.8 | 0.068 | 12.51 |
| **382** | 0.41 | 70 | 8 | 0.162 | | 50.4 | 0.073 | 15.91 |
| **383** | 0.48 | 69 | 20.55 | 0.154 | | 66.7 | 0.07 | 14.36 |
| **384** | 0.52 | 72 | 12.07 | 0.174 | | 57.6 | 0.07 | 15.86 |
| **385** | 0.52 | 69 | 21.88 | 0.173 | | 71.1 | 0.072 | 15.88 |
| **386** | 0.67 | 87 | 3.96 | 0.236 | | 47.3 | 0.077 | 17.44 |
| **387** | 0.52 | 89 | 3.74 | 0.215 | | 43.1 | 0.064 | 15.86 |
| **388** | 0.51 | 81 | 2.01 | 0.207 | | 36.7 | 0.07 | 14.65 |
| **389** | 0.56 | 80 | 2.32 | 0.207 | | 38.7 | 0.07 | 15.03 |
| **390** | 0.49 | 76 | 4.1 | 0.224 | | 40.9 | 0.074 | 15.6 |
| **391** | 0.61 | 76 | 4.12 | 0.219 | | 47 | 0.072 | 15.72 |
| **392** | 0.47 | 77 | 4.83 | 0.217 | | 41 | 0.075 | 15.51 |
| **393** | 0.57 | 82 | 19.02 | 0.186 | | 52.2 | 0.083 | 16.63 |
| **394** | 0.76 | 109 | 11.01 | 0.192 | | 53.6 | 0.07 | 14.83 |
| **395** | 0.72 | 105 | 12.24 | 0.201 | | 57.3 | 0.069 | 14.03 |
| **396** | 0.58 | 99 | 3.95 | 0.211 | | 36.2 | 0.063 | 15.13 |
| **399** | 0.67 | 111 | 4.97 | 0.192 | | 40.6 | 0.068 | 15.37 |
| **400** | 0.63 | 93 | 3.88 | 0.207 | | 39.8 | 0.07 | 17.29 |
| **401** | 0.63 | 95 | 3.78 | 0.21 | | 41.3 | 0.076 | 15.16 |
| **402** | 0.65 | 102 | 4 | 0.212 | | 40.7 | 0.076 | 15.69 |
| **403** | 0.69 | 109 | 3.89 | 0.219 | | 45.2 | 0.082 | 16.19 |
| **404** | 0.5 | 93 | 2.38 | 0.241 | | 39.7 | 0.074 | 17.17 |
| **405** | 0.47 | 94 | 2.45 | 0.217 | | 38.1 | 0.068 | 15.56 |

| **Element** | Pd | Pt | Rb | Re | S | Sb | Sc | Se |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 10 | 2 | 0.1 | 1 | 0.02 | 0.02 | 0.1 | 0.1 |
| **Samples** | ppb | ppb | ppm | ppb | % | ppm | ppm | ppm |
| **356** | < 10 | < 2 | 18.4 | 14 | 1.63 | 0.77 | 4.4 | 2.1 |
| **357** | | | | | 2.24 | 0.79 | 4.3 | 2.1 |
| **358** | | | | | 1.81 | 0.69 | 4.6 | 2 |
| **359** | | | | | 1.98 | 0.68 | 4.6 | 1.7 |
| **360** | < 10 | < 2 | 17.9 | 17 | 1.72 | 1.01 | 4.9 | 2.5 |
| **361** | | | | | 2.08 | 1.12 | 3.3 | 1.8 |
| **362** | | | | | 2 | 0.79 | 4.1 | 2.1 |
| **363** | | | | | 1.97 | 1.09 | 3.7 | 2.6 |
| **364** | | | | | 1.88 | 0.95 | 4.4 | 2.3 |
| **365** | < 10 | 2 | 18.7 | 22 | 1.56 | 0.96 | 5.4 | 2.4 |
| **366** | | | | | 1.99 | 0.83 | 4.5 | 2.3 |
| **367** | | | | | 1.96 | 0.81 | 4.6 | 2.1 |
| **368** | | | | | 1.92 | 0.92 | 4.6 | 2.2 |
| **369** | < 10 | < 2 | 17 | 21 | 1.66 | 1.39 | 5.1 | 2.4 |
| **370** | | | | | 2.13 | 0.88 | 5 | 2.4 |
| **371** | | | | | 1.99 | 0.89 | 4.5 | 2.2 |
| **372** | | | | | 2.39 | 0.92 | 4.5 | 2.5 |
| **373** | < 10 | 2 | 16.8 | 12 | 1.82 | 0.98 | 4.2 | 2.3 |
| **374** | | | | | 1.88 | 0.86 | 4.7 | 2.4 |
| **375** | | | | | 1.88 | 0.88 | 5.3 | 2.5 |
| **376** | < 10 | < 2 | 17 | 22 | 1.85 | 0.98 | 5.5 | 2.8 |
| **377** | | | | | 2.6 | 1.35 | 4.7 | 3.7 |
| **378** | | | | | 2.7 | 1.16 | 4.7 | 3.5 |
| **379** | | | | | 2.55 | 1.09 | 4.7 | 3.4 |
| **380** | | | | | 2.53 | 1.18 | 4.9 | 3.6 |
| **381** | | | | | 2.48 | 0.95 | 3.9 | 3.3 |
| **382** | | | | | 2.81 | 1.1 | 4.2 | 2.9 |
| **383** | | | | | 2.48 | 1.62 | 4.5 | 4.3 |
| **384** | | | | | 2.72 | 1.57 | 4.6 | 3.5 |
| **385** | | | | | 2.87 | 1.91 | 4.4 | 4.6 |
| **386** | | | | | 2.37 | 0.68 | 5.7 | 1.8 |
| **387** | | | | | 2.03 | 0.6 | 4.6 | 1.4 |
| **388** | | | | | 1.98 | 0.49 | 5.1 | 1.2 |
| **389** | | | | | 2.16 | 0.51 | 5.3 | 1.3 |
| **390** | | | | | 2.35 | 0.99 | 4.6 | 1.7 |
| **391** | | | | | 2.21 | 0.77 | 5.5 | 1.8 |
| **392** | | | | | 2.5 | 1.13 | 4.4 | 1.7 |
| **393** | | | | | 2.99 | 1.48 | 3.7 | 3.7 |
| **394** | | | | | 2.89 | 1.24 | 5.3 | 3.7 |
| **395** | | | | | 2.95 | 1.09 | 5.3 | 3.3 |
| **396** | | | | | 2.2 | 0.86 | 4.2 | 1.6 |
| **399** | | | | | 2.54 | 0.65 | 4.8 | 2.1 |
| **400** | | | | | 2.78 | 0.75 | 4.7 | 1.9 |
| **401** | | | | | 2.57 | 0.79 | 4.8 | 2 |
| **402** | | | | | 2.61 | 0.76 | 5.3 | 1.8 |
| **403** | | | | | 2.6 | 0.78 | 5 | 2.1 |
| **404** | | | | | 2.56 | 0.56 | 4.8 | 1.4 |
| **405** | | | | | 2.55 | 0.54 | 5.3 | 1.3 |

| **Element** | Sn | Sr | Ta | Te | Th | Ti | Tl | U |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.1 | 0.5 | 0.05 | 0.02 | 0.1 | 0.001 | 0.02 | 0.1 |
| **Samples** | ppm | ppm | ppm | ppm | ppm | % | ppm | ppm |
| **356** | 0.5 | 68 | < .05 | 0.09 | 5 | 0.007 | 0.22 | 1.59 |
| **357** |  | 87.9 |  | 0.07 | 4.8 | < .001 | 0.15 | 2.16 |
| **358** |  | 69.5 |  | 0.1 | 4.7 | 0.002 | 0.21 | 1.88 |
| **359** |  | 88.3 |  | 0.09 | 4.9 | < .001 | 0.09 | 1.85 |
| **360** | 0.5 | 79.1 | < .05 | 0.09 | 5.8 | 0.005 | 0.28 | 2.45 |
| **361** |  | 53.4 |  | 0.08 | 21.1 | < .001 | 0.24 | 3.23 |
| **362** |  | 115.7 |  | 0.05 | 4.8 | < .001 | 0.12 | 2.98 |
| **363** |  | 73.5 |  | 0.08 | 5 | 0.003 | 0.19 | 1.93 |
| **364** |  | 80.6 |  | 0.07 | 4.9 | < .001 | 0.19 | 2.21 |
| **365** | 0.5 | 86.5 | < .05 | 0.09 | 4.9 | 0.002 | 0.21 | 2.5 |
| **366** |  | 87.2 |  | 0.09 | 4.9 | 0.001 | 0.19 | 2.32 |
| **367** |  | 86.7 |  | 0.07 | 4.7 | < .001 | 0.15 | 2.02 |
| **368** |  | 82.6 |  | 0.08 | 4.6 | 0.001 | 0.2 | 1.99 |
| **369** | 0.4 | 91.3 | < .05 | 0.06 | 4.6 | < .001 | 0.22 | 2.23 |
| **370** |  | 90.7 |  | 0.08 | 4.8 | 0.007 | 0.14 | 2.88 |
| **371** |  | 74.4 |  | 0.11 | 4.6 | < .001 | 0.22 | 1.89 |
| **372** |  | 92.8 |  | 0.06 | 5.1 | 0.001 | 0.12 | 2.79 |
| **373** | 0.5 | 96.4 | < .05 | 0.08 | 4.4 | 0.004 | 0.16 | 2.23 |
| **374** |  | 83 |  | 0.1 | 4.7 | < .001 | 0.19 | 1.91 |
| **375** |  | 144.3 |  | 0.1 | 4.5 | 0.002 | 0.18 | 3.12 |
| **376** | 0.5 | 144.9 | < .05 | 0.1 | 4.4 | 0.007 | 0.18 | 3.17 |
| **377** |  | 102.9 |  | 0.07 | 4.3 | < .001 | 0.2 | 3.01 |
| **378** |  | 91.6 |  | 0.11 | 4.4 | 0.001 | 0.15 | 3.38 |
| **379** |  | 152.9 |  | 0.1 | 3.9 | 0.003 | 0.14 | 3.56 |
| **380** |  | 142.5 |  | 0.12 | 4.1 | 0.001 | 0.24 | 3.96 |
| **381** |  | 161.6 |  | 0.09 | 4 | 0.001 | 0.09 | 3.89 |
| **382** |  | 107.2 |  | 0.11 | 4.4 | 0.001 | 0.13 | 2.24 |
| **383** |  | 128.4 |  | 0.08 | 4 | 0.001 | 0.32 | 3.12 |
| **384** |  | 87.5 |  | 0.1 | 4.8 | 0.001 | 0.4 | 1.96 |
| **385** |  | 108.1 |  | 0.11 | 4.6 | 0.001 | 0.36 | 2.97 |
| **386** |  | 76.3 |  | 0.12 | 5.4 | 0.001 | 0.16 | 1.1 |
| **387** |  | 65.5 |  | 0.07 | 4.8 | 0.002 | 0.17 | 1.09 |
| **388** |  | 80.7 |  | 0.07 | 4.8 | 0.001 | 0.07 | 1.04 |
| **389** |  | 80.2 |  | 0.07 | 4.7 | 0.001 | 0.08 | 0.99 |
| **390** |  | 79.3 |  | 0.08 | 5.1 | 0.001 | 0.1 | 1.22 |
| **391** |  | 87.5 |  | 0.08 | 4.9 | 0.001 | 0.18 | 1.2 |
| **392** |  | 81.6 |  | 0.08 | 4.8 | 0.001 | 0.11 | 1.35 |
| **393** |  | 104.7 |  | 0.09 | 5.1 | 0.001 | 0.17 | 2.71 |
| **394** |  | 79.1 |  | 0.12 | 4.5 | 0.001 | 0.19 | 2.17 |
| **395** |  | 89.8 |  | 0.15 | 4.4 | 0.001 | 0.23 | 1.92 |
| **396** |  | 72 |  | 0.08 | 5 | 0.001 | 0.1 | 1.22 |
| **399** |  | 70.4 |  | 0.08 | 4.9 | 0.001 | 0.09 | 1.94 |
| **400** |  | 63.3 |  | 0.09 | 5.1 | 0.001 | 0.1 | 1.35 |
| **401** |  | 64.7 |  | 0.09 | 4.8 | 0.001 | 0.11 | 1.49 |
| **402** |  | 72.5 |  | 0.08 | 4.8 | 0.002 | 0.11 | 1.48 |
| **403** |  | 66.8 |  | 0.07 | 4.8 | 0.001 | 0.09 | 1.57 |
| **404** |  | 69.5 |  | 0.08 | 5.2 | 0.001 | 0.08 | 1.1 |
| **405** |  | 73.4 |  | 0.07 | 4.6 | 0.002 | 0.07 | 1.04 |

***Analysis: GROUP 1EX - 0.25 GM***

| **Element** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ag** | **Al** | **As** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.1** | **0.01** | **0.1** | **0.1** | **0.1** | **0.01** | **1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** |
| **356** | 32 | <.1 | 9.67 | 131.6 | 1.2 | 0.3 | 8.29 | 12 |
| **357** | 30 | <.1 | | 135.7 | | | | |
| **358** | 33 | <.1 | | 150.2 | | | | |
| **359** | 27 | <.1 | | 190.2 | | | | |
| **360** | 27 | <.1 | 11.13 | 146.1 | 1.2 | 0.3 | 8.62 | 15 |
| **361** | 36 | <.1 | | 100.3 | | | | |
| **362** | 49 | <.1 | | 127.4 | | | | |
| **363** | 37 | <.1 | | 134.3 | | | | |
| **364** | 36 | <.1 | | 134.3 | | | | |
| **365** | 31 | <.1 | 11.69 | 123.7 | 1.4 | 0.2 | 8.18 | 12 |
| **366** | 34 | <.1 | | 146 | | | | |
| **367** | 35 | <.1 | | 142.8 | | | | |
| **368** | 34 | <.1 | | 134.7 | | | | |
| **369** | 32 | <.1 | 10.69 | 160.9 | 1.1 | 0.3 | 8.29 | 14 |
| **370** | 33 | <.1 | | 156.6 | | | | |
| **371** | 33 | <.1 | | 155.8 | | | | |
| **372** | 35 | <.1 | | 150.9 | | | | |
| **373** | 27 | <.1 | 9.78 | 148.1 | 1.2 | 0.3 | 8.34 | 18 |
| **374** | 35 | <.1 | | 165.4 | | | | |
| **375** | 38 | <.1 | | 146.9 | | | | |
| **376** | 33 | <.1 | 11.41 | 132.7 | 1.3 | 0.3 | 7.81 | 14 |
| **377** | 37 | <.1 | | 158.3 | | | | |
| **378** | 34 | <.1 | | 147.7 | | | | |
| **379** | 30 | <.1 | | 137.9 | | | | |
| **380** | 53 | <.1 | | 149.1 | | | | |
| **381** | 34 | <.1 | | 145.3 | | | | |
| **382** | 27 | <.1 | | 177.8 | | | | |
| **383** | 51 | <.1 | | 146.8 | | | | |
| **384** | 42 | <.1 | | 222.4 | | | | |
| **385** | 49 | <.1 | | 181 | | | | |
| **386** | 29 | <.1 | | 133.1 | | | | |
| **387** | 27 | <.1 | | 170.6 | | | | |
| **388** | 24 | <.1 | | 118.4 | | | | |
| **389** | 24 | <.1 | | 111.3 | | | | |
| **390** | 25 | <.1 | | 152.5 | | | | |
| **391** | 29 | <.1 | | 105.4 | | | | |
| **392** | 26 | <.1 | | 136.7 | | | | |
| **393** | 33 | <.1 | | 153.5 | | | | |
| **394** | 33 | <.1 | | 156.9 | | | | |
| **395** | 37 | <.1 | | 186.2 | | | | |
| **396** | 22 | <.1 | | 131.3 | | | | |
| **399** | 27 | <.1 | | 106.7 | | | | |
| **400** | 24 | <.1 | | 117.3 | | | | |
| **401** | 26 | <.1 | | 125 | | | | |
| **402** | 26 | <.1 | | 148.4 | | | | |
| **403** | 28 | <.1 | | 117.8 | | | | |
| **404** | 26 | <.1 | | 170 | | | | |
| **405** | 26 | <.1 | | 115.7 | | | | |

| **Element** | **Au** | **Ba** | **Be** | **Bi** | **Ca** | **Cd** | **Ce** | **Co** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **1** | **1** | **0.1** | **0.01** | **0.1** | **1** | **1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **ppm** |
| **356** | < .1 | 201 | 4 | 0.3 | 1.93 | 0.8 | 54 | 12 |
| **360** | < .1 | 163 | 1 | 0.3 | 2.57 | 1 | 50 | 15 |
| **365** | < .1 | 259 | 2 | 0.3 | 2.87 | 1 | 58 | 14 |
| **369** | < .1 | 169 | 1 | 0.3 | 3.27 | 0.9 | 46 | 13 |
| **373** | < .1 | 190 | 3 | 0.3 | 2.93 | 0.9 | 58 | 15 |
| **376** | < .1 | 205 | 3 | 0.3 | 4.4 | 0.9 | 48 | 13 |

| **Element** | **Cr** | **Cu** | **Fe** | **Hf** | **K** | **La** | **Li** | **Mg** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **0.01** | **0.1** | **0.01** | **0.1** | **0.1** | **0.01** |
| **Samples** | **ppm** | **ppm** | **%** | **ppm** | **%** | **ppm** | **ppm** | **%** |
| **356** | 108.3 | 34.5 | 3.17 | 2 | 2.12 | 28.6 | 77.8 | 0.83 |
| **360** | 107.5 | 38.5 | 3.3 | 2.1 | 2.26 | 26.8 | 74.7 | 0.89 |
| **365** | 104.3 | 34 | 3.36 | 2 | 2.26 | 31.6 | 59.5 | 0.9 |
| **369** | 106.6 | 35.6 | 3.46 | 1.8 | 2.25 | 24.7 | 63.8 | 0.95 |
| **373** | 109 | 40.9 | 3.69 | 1.9 | 2.36 | 30.7 | 71.4 | 0.91 |
| **376** | 96.8 | 35.8 | 3.44 | 1.7 | 2.06 | 25.4 | 62 | 0.89 |

| **Element** | **Mn** | **Mo** | **Na** | **Nb** | **Ni** | **P** | **Pb** | **Rb** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **1** | **0.1** | **0.001** | **0.1** | **0.1** | **0.001** | **0.1** | **0.1** |
| **Samples** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **356** | 75 | 6.7 | 0.423 | 13.9 | 48.8 | 0.076 | 19.1 | 101.8 |
| **360** | 88 | 9.8 | 0.428 | 15.1 | 57.9 | 0.087 | 20.8 | 73.9 |
| **365** | 99 | 10.6 | 0.427 | 13.2 | 54.6 | 0.09 | 16.9 | 94.6 |
| **369** | 83 | 12.3 | 0.418 | 12.1 | 59.6 | 0.082 | 17.7 | 71.3 |
| **373** | 96 | 12 | 0.446 | 13.7 | 54.7 | 0.087 | 19.1 | 107.1 |
| **376** | 99 | 14 | 0.361 | 10.9 | 51.6 | 0.081 | 15.8 | 75.4 |

| **Element** | **S** | **Sb** | **Sc** | **Sn** | **Sr** | **Ta** | **Th** | **Ti** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **1** | **0.1** | **1** | **0.1** | **0.1** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **356** | 1.9 | 1.3 | 10 | 1.9 | 177 | 0.9 | 8.3 | 0.41 |
| **360** | 2.1 | 1.8 | 10 | 2.2 | 198 | 1 | 8.1 | 0.4 |
| **365** | 1.9 | 2 | 11 | 2.2 | 196 | 0.8 | 7.9 | 0.41 |
| **369** | 2.2 | 2 | 11 | 2.1 | 194 | 0.8 | 7 | 0.408 |
| **373** | 2.4 | 2 | 11 | 2.3 | 229 | 0.9 | 8.4 | 0.421 |
| **376** | 2.3 | 1.8 | 10 | 1.6 | 236 | 0.7 | 7 | 0.362 |

***Analysis: GROUP 4B - REE - 0.200 GM***

| **Element** | U | V | W | Y | Zn | Zr | Ce | Co |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.1 | 1 | 0.1 | 0.1 | 1 | 0.1 | 0.5 | 0.5 |
| **Samples** | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm |
| **356** | 4 | 265 | 1.1 | 13.2 | 154 | 62.7 | 73 | 12.4 |
| **360** | 5.1 | 257 | 1.2 | 14.7 | 166 | 67.3 | 76.6 | 13.5 |
| **365** | 4.7 | 258 | 1.2 | 14.8 | 156 | 60.5 | 76.3 | 13.2 |
| **369** | 4.7 | 269 | 1.1 | 13.5 | 180 | 62.6 | 71.9 | 13 |
| **373** | 5.1 | 259 | 1.2 | 14.3 | 181 | 65 | 70.9 | 15.3 |
| **376** | 4.8 | 239 | 1 | 14.2 | 144 | 54.4 | 65.3 | 13.1 |

| **Element** | Cs | Dy | Er | Eu | Ga | Gd | Hf | Ho |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.1 | 0.05 | 0.05 | 0.05 | 0.5 | 0.05 | 0.5 | 0.05 |
| **Samples** | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm |
| **356** | 10.6 | 4.4 | 2.41 | 1.21 | 21.2 | 4.73 | 3.9 | 0.92 |
| **360** | 10.6 | 4.48 | 2.52 | 1.27 | 22.3 | 4.87 | 4.2 | 0.86 |
| **365** | 10.4 | 4.57 | 2.42 | 1.27 | 23 | 4.91 | 3.6 | 0.88 |
| **369** | 10 | 4.27 | 2.38 | 1.05 | 20 | 4.52 | 3.7 | 0.86 |
| **373** | 10.3 | 4.03 | 2.37 | 1 | 21.3 | 4.33 | 4.1 | 0.85 |
| **376** | 9.1 | 3.69 | 2.17 | 1.03 | 18.7 | 4.48 | 3.3 | 0.77 |

| **Element** | La | Lu | Nb | Nd | Pr | Sn | Rb | Sm |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.5 | 0.01 | 0.5 | 0.4 | 0.02 | 1 | 0.5 | 0.1 |
| **Samples** | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm |
| **356** | 39.4 | 0.4 | 18.4 | 34.1 | 8.7 | 2 | 141.9 | 6.1 |
| **360** | 41.6 | 0.41 | 18 | 32.6 | 9.11 | 2 | 139.7 | 6.1 |
| **365** | 40.7 | 0.42 | 17.3 | 35.4 | 9.13 | 2 | 139.4 | 6.3 |
| **369** | 38.3 | 0.39 | 17.2 | 32.7 | 8.44 | 2 | 140.1 | 5.9 |
| **373** | 38.8 | 0.38 | 17.7 | 34.1 | 8.53 | 2 | 141.8 | 5.6 |
| **376** | 34.6 | 0.38 | 15.3 | 29.4 | 7.84 | 1 | 127.2 | 5.5 |

| **Element** | Sr | Ta | Tb | Th | Tm | U | V | W |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 0.5 | 0.1 | 0.01 | 0.1 | 0.05 | 0.1 | 5 | 0.1 |
| **Samples** | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm |
| **356** | 179.9 | 1.2 | 0.7 | 12.1 | 0.38 | 6 | 292 | 1.5 |
| **360** | 201.4 | 1.2 | 0.83 | 11.7 | 0.43 | 6.5 | 275 | 1.4 |
| **365** | 202.5 | 1 | 0.76 | 11.6 | 0.42 | 6.6 | 275 | 1.6 |
| **369** | 199 | 1.1 | 0.71 | 11.1 | 0.38 | 6.5 | 294 | 1.3 |
| **373** | 217.1 | 1.1 | 0.73 | 10.6 | 0.38 | 6.9 | 260 | 1.4 |
| **376** | 253.1 | 0.9 | 0.66 | 9 | 0.38 | 7.5 | 249 | 1.2 |

***Analysis: GROUP 4A - 0.200 GM***

| **Element** | **Y** | **Yb** | **Zr** | **Al2O3** | **Ba** | **CaO** | **Cr2O3** | **Cr2O3** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.05** | **0.5** | **0.03** | **5** | **0.01** | **0.001** | **0.001** |
| **Samples** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **%** | **%** | **%** |
| **356** | 27.2 | 2.62 | 133 | 15.49 | 1010 | 2.96 | 0.015 | 0.0149 |
| **360** | 27.7 | 2.92 | 126.2 | 15.68 | 1043 | 3.81 | 0.014 | 0.0142 |
| **365** | 27.7 | 2.67 | 119 | 15.56 | 1078 | 4.31 | 0.014 | 0.014 |
| **369** | 26.6 | 2.79 | 125 | 15.15 | 1024 | 4.93 | 0.014 | 0.0143 |
| **373** | 25.8 | 2.62 | 123.1 | 15.56 | 1019 | 4.28 | 0.015 | 0.0151 |
| **376** | 25.4 | 2.37 | 109.3 | 14.61 | 1051 | 7.45 | 0.014 | 0.0142 |

| **Element** | **Fe2O3** | **K2O** | **LOI** | **MgO** | **MnO** | **Na2O** | **Ni** | **P2O5** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.04** | **0.04** | **0.1** | **0.01** | **0.01** | **0.01** | **30** | **0.01** |
| **Samples** | **%** | **%** | **%** | **%** | **%** | **%** | **ppm** | **%** |
| **356** | 4.53 | 2.79 | 11 | 1.49 | 0.01 | 0.54 | 47 | 0.21 |
| **360** | 4.52 | 2.81 | 11.5 | 1.56 | 0.01 | 0.55 | 64 | 0.22 |
| **365** | 4.59 | 2.82 | 11.6 | 1.59 | 0.01 | 0.55 | 39 | 0.22 |
| **369** | 4.73 | 2.75 | 12.5 | 1.66 | 0.01 | 0.56 | 67 | 0.2 |
| **373** | 4.9 | 2.88 | 11.7 | 1.59 | 0.01 | 0.59 | 72 | 0.21 |
| **376** | 5.11 | 2.74 | 13.4 | 1.67 | 0.01 | 0.48 | 43 | 0.22 |

***Analysis: CO2***

| **Element** | **Sc** | **SiO2** | **TiO2** | **TOT/C** | **TOT/S** | **SUM** | **C/ORG** | **C/GRA** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **1** | **0.02** | **0.01** | **0.01** | **0.01** | | | |
| **Samples** | **ppm** | **%** | **%** | **%** | **%** | **%** | **%** | **%** |
| **356** | 14 | 59.51 | 0.74 | 3.29 | 2.32 | 99.4 | 2.57 | 0.04 |
| **360** | 14 | 57.99 | 0.71 | 3.73 | 2.27 | 99.5 | 2.88 | 0.03 |
| **365** | 15 | 57.45 | 0.7 | 3.76 | 2.02 | 99.54 | 2.76 | 0.03 |
| **369** | 15 | 56.21 | 0.69 | 4.09 | 2.37 | 99.53 | 2.95 | 0.03 |
| **373** | 14 | 56.91 | 0.71 | 3.64 | 2.48 | 99.48 | 2.66 | 0.03 |
| **376** | 14 | 53.1 | 0.65 | 4.58 | 2.51 | 99.58 | 3.09 | 0.03 |

| **Element** | **CO2** | **SO4** |
|---|---|---|
| **LDL** | | |
| **Samples** | **%** | **%** |
| **356** | 2.51 | 1.23 |
| **360** | 3.03 | 1.68 |
| **365** | 3.58 | 1.47 |
| **369** | 4.07 | 1.82 |
| **373** | 3.49 | 1.84 |
| **376** | 5.35 | 2.14 |

| **Samples** | **Hole** | **Latitude** | **Longitude** | **From (m)** | **To (m)** | **Analysis Date** |
|---|---|---|---|---|---|---|
| **407** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 759.990 | 760.060 | Dec. 2003 |
| **408** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 760.390 | 760.440 | Dec. 2003 |
| **410** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 761.370 | 761.380 | Dec. 2003 |
| **411** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 761.420 | 761.450 | Dec. 2003 |
| **412** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 761.465 | 761.520 | Dec. 2003 |
| **414** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 762.350 | 762.390 | Dec. 2003 |
| **415** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 763.430 | 763.480 | Dec. 2003 |
| **417** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 764.330 | 764.350 | Dec. 2003 |
| **418** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 764.465 | 764.520 | Dec. 2003 |
| **419** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 765.020 | 765.065 | Dec. 2003 |
| **420** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 765.445 | 765.495 | Dec. 2003 |
| **421** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 766.450 | 766.520 | Dec. 2003 |
| **423** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 767.560 | 767.610 | Dec. 2003 |
| **424** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 767.745 | 767.810 | Dec. 2003 |
| **425** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 768.505 | 768.575 | Dec. 2003 |
| **426** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 769.445 | 769.505 | Dec. 2003 |
| **427** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 770.490 | 770.550 | Dec. 2003 |
| **429** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 771.520 | 771.580 | Dec. 2003 |
| **430** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 772.440 | 772.510 | Dec. 2003 |
| **432** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 773.500 | 773.540 | Dec. 2003 |
| **434** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 774.510 | 774.540 | Dec. 2003 |
| **435** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 775.060 | 775.130 | Dec. 2003 |
| **436** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 775.550 | 775.595 | Dec. 2003 |
| **437** | 00/04-02-071-18W5/0 | 55.114423 | -116.66306 | 776.550 | 776.600 | Dec. 2003 |
| **438** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1950.330 | 1950.350 | Dec. 2003 |
| **439** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1950.370 | 1950.415 | Dec. 2003 |
| **440** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1951.450 | 1951.500 | Dec. 2003 |
| **442** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1952.495 | 1952.445 | Dec. 2003 |
| **443** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1953.415 | 1953.470 | Dec. 2003 |
| **445** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1954.440 | 1954.510 | Dec. 2003 |
| **445** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1954.440 | 1954.510 | April 2004 |
| **446** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1955.470 | 1955.535 | Dec. 2003 |
| **447** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1956.380 | 1956.430 | Dec. 2003 |
| **448** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1957.410 | 1957.470 | Dec. 2003 |
| **449** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1958.390 | 1958.450 | Dec. 2003 |
| **450** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1959.400 | 1959.445 | Dec. 2003 |
| **451** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1960.500 | 1960.555 | Dec. 2003 |
| **452** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1961.420 | 1961.490 | Dec. 2003 |
| **453** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1962.390 | 1962.460 | Dec. 2003 |
| **454** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1963.480 | 1963.550 | Dec. 2003 |
| **454** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1963.480 | 1963.550 | April 2004 |
| **455** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1964.430 | 1964.490 | Dec. 2003 |
| **456** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1965.455 | 1965.520 | Dec. 2003 |
| **457** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1966.460 | 1966.500 | Dec. 2003 |
| **458** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1966.920 | 1966.940 | Dec. 2003 |
| **459** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1967.445 | 1967.505 | Dec. 2003 |

| **Samples** | **Probability of Fm** | **Formation** | **Sample Description** |
|---|---|---|---|
| 407 | Unknown | Belle Fourche (or underlying unit) | Red Layer |
| 408 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale with abundant silt, micas |
| 410 | Unknown | Belle Fourche (or underlying unit) | Red/brown layer/nodule, siderite? |
| 411 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, silty pockets |
| 412 | Unknown | Belle Fourche (or underlying unit) | Lams of red particles within sand - thin section (?) |
| 414 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale with sand lams, silty, abundant micas |
| 415 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale + sand lams and soft sed |
| 417 | Unknown | Belle Fourche (or underlying unit) | Red/brown layer/nodule, siderite? |
| 418 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale with silt and micas, with red layer - siderite? |
| 419 | Unknown | Belle Fourche (or underlying unit) | Orange/red/brown layer/nodule - siderite? Surrounded by dk grey shale |
| 420 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, silty, some brown colouration is areas |
| 421 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, silty, abundant black organic material - fish remains? |
| 423 | Unknown | Belle Fourche (or underlying unit) | Med Sand (contact between shale and large sand), some red specks, white and black grains |
| 424 | Unknown | Belle Fourche (or underlying unit) | Med Sand , black and white grains |
| 425 | Unknown | Belle Fourche (or underlying unit) | Sand, red specks, micas |
| 426 | Unknown | Belle Fourche (or underlying unit) | Sand with red specks |
| 427 | Unknown | Belle Fourche (or underlying unit) | Sand, black, white and red coloured grains |
| 429 | Unknown | Belle Fourche (or underlying unit) | Sand, some red/brown grains, some black grains |
| 430 | Unknown | Belle Fourche (or underlying unit) | Sand, black and white grains |
| 432 | Unknown | Belle Fourche (or underlying unit) | Broken fragments of shale, silty, some areas of concentrated micas |
| 434 | Unknown | Belle Fourche (or underlying unit) | Broken fragments of dk grey shale, some silt |
| 435 | Unknown | Belle Fourche (or underlying unit) | Burnt unit? Siderite? Redish/brown rim, med brown inner area |
| 436 | Unknown | Belle Fourche (or underlying unit) | Med grey shale, very silty with some sand, mica rich |
| 437 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale + black organics (thin section?), micas, some sandy lams |
| 438 | Unknown | Second White Specks | Pyrite shell (?), in dk grey slightly silty shale |
| 439 | Unknown | Second White Specks | Dk grey shale, some silt |
| 440 | Unknown | Second White Specks | Dk grey shale, minor silt, shelly fragments |
| 442 | Unknown | Second White Specks | Dk grey shale, shelly remains, some silt |
| 443 | Unknown | Second White Specks | Dk grey shale, a little silt |
| 445 | Unknown | Second White Specks | Dk grey shale, some shelly fragments and silt |
| 445 | Unknown | Second White Specks | Dk grey shale, some shelly fragments and silt |
| 446 | Unknown | Upper Belle Fourche | Dk grey shale with silty/sandy lams |
| 447 | Unknown | Upper Belle Fourche | Dk grey shale, shelly fragments, silty lams |
| 448 | Unknown | Upper Belle Fourche | Dk grey shale, some silt, abundant shelly fragments |
| 449 | Unknown | Upper Belle Fourche | Dk grey shale, shelly fragments, silty lams |
| 450 | Unknown | Upper Belle Fourche | Dk grey shale, some micas, silt |
| 451 | Unknown | Upper Belle Fourche | Dk grey shale, silty lams, smooth, abundant shelly fragments |
| 452 | Unknown | Upper Belle Fourche | Dk grey shale, some silt |
| 453 | Unknown | Upper Belle Fourche | Dk grey shale, some silt, shelly debris |
| 454 | Unknown | Upper Belle Fourche | Dk grey shale, smooth, black organic debris |
| 454 | Unknown | Upper Belle Fourche | Dk grey shale, smooth, black organic debris |
| 455 | Unknown | Upper Belle Fourche | Dk grey shale, some silt, black organic fragments |
| 456 | Unknown | Upper Belle Fourche | Dk grey shale, some silt, black organic fragments |
| 457 | Unknown | Upper Belle Fourche | Dk grey shale, some black organic debris, some silt |
| 458 | Unknown | Upper Belle Fourche | Pyrite laminations |
| 459 | Unknown | Upper Belle Fourche | Dk grey shale, smooth, some silt, black organic debris |

***Analysis: GROUP 1F1 - 1.00 GM***

| **Element** | **Ag** | **Al** | **As** | **Au** | **B** | **Ba** | **Be** | **Bi** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** | **0.1** | **0.02** |
| **Samples** | **ppb** | **%** | **ppm** | **ppb** | **ppm** | **ppm** | **ppm** | **ppm** |
| **407** | 168 | 1.08 | 10.2 | 0.5 | 10 | 83.1 | | 0.24 |
| **408** | 235 | 1.46 | 21.1 | 0.8 | 16 | 102.3 | | 0.37 |
| **410** | 176 | 0.72 | 8.9 | 0.4 | 8 | 453.1 | | 0.12 |
| **411** | 374 | 1.58 | 14.7 | 0.9 | 16 | 429.7 | | 0.33 |
| **412** | 198 | 0.84 | 14.3 | 0.2 | 9 | 289 | | 0.08 |
| **414** | 222 | 1.24 | 11.5 | 1.2 | 16 | 365.1 | | 0.25 |
| **415** | 193 | 1.03 | 14.2 | 1.3 | 18 | 305.9 | | 0.22 |
| **417** | 165 | 0.53 | 4.2 | 0.8 | 12 | 430.3 | | 0.12 |
| **418** | 293 | 1.11 | 4.5 | 1.8 | 15 | 348.4 | | 0.23 |
| **419** | 366 | 1.14 | 2 | 1.4 | 13 | 389.7 | | 0.27 |
| **420** | 336 | 1.22 | 16.3 | 1.8 | 15 | 342.2 | | 0.27 |
| **421** | 333 | 1.17 | 2.7 | 1.6 | 16 | 378.3 | | 0.25 |
| **423** | 95 | 0.46 | 8.2 | 1.4 | 8 | 149.3 | | 0.08 |
| **424** | 102 | 0.44 | 7.1 | 1.2 | 7 | 149.5 | | 0.07 |
| **425** | 64 | 0.35 | 5.5 | 0.7 | 6 | 369.2 | | 0.05 |
| **426** | 63 | 0.33 | 4.1 | 0.5 | 10 | 589.6 | | 0.04 |
| **427** | 59 | 0.34 | 4.4 | 1 | 4 | 531.3 | | 0.04 |
| **429** | 62 | 0.39 | 3.7 | 1 | 5 | 706.5 | | 0.04 |
| **430** | 63 | 0.34 | 5.7 | < .2 | 4 | 348.1 | | 0.03 |
| **432** | 381 | 1.26 | 7.5 | 1.5 | 14 | 471.1 | | 0.3 |
| **434** | 245 | 1.2 | 18.8 | 1 | 18 | 384.7 | | 0.3 |
| **435** | 208 | 0.87 | 3.2 | 0.8 | 12 | 283 | | 0.13 |
| **436** | 388 | 1.27 | 2.8 | 1.4 | 15 | 402.6 | | 0.28 |
| **437** | 426 | 1.08 | 9.7 | 1.4 | 18 | 360.9 | | 0.23 |
| **438** | 282 | 0.72 | 29.7 | 0.2 | 6 | 51.7 | | 0.25 |
| **439** | 312 | 0.62 | 30 | 0.3 | 7 | 42.9 | | 0.25 |
| **440** | 374 | 0.56 | 32.9 | 0.2 | 9 | 47.9 | | 0.24 |
| **442** | 377 | 0.62 | 30 | 0.4 | 7 | 41.5 | | 0.25 |
| **443** | 347 | 0.59 | 35 | 0.3 | 7 | 42.8 | | 0.25 |
| **445** | 317 | 0.52 | 33.1 | < .2 | 8 | 42.9 | | 0.23 |
| **446** | 109 | 0.21 | 13 | < .2 | 1 | 290.3 | | 0.07 |
| **447** | 298 | 0.58 | 24.9 | 0.4 | 10 | 58.3 | | 0.23 |
| **448** | 261 | 0.6 | 22.6 | 0.2 | 5 | 51 | | 0.22 |
| **449** | 241 | 0.69 | 23.3 | 0.3 | 6 | 49.9 | | 0.23 |
| **450** | 245 | 0.68 | 24.2 | < .2 | 8 | 51.6 | | 0.23 |
| **451** | 248 | 0.72 | 25 | 0.2 | 7 | 45.2 | | 0.2 |
| **452** | 257 | 0.73 | 24.5 | 0.4 | 6 | 47.4 | | 0.22 |
| **453** | 225 | 0.75 | 27.6 | 0.3 | 7 | 45.5 | | 0.24 |
| **454** | 229 | 0.74 | 28.3 | 1.6 | 9 | 66.3 | | 0.27 |
| **455** | 210 | 0.76 | 23.8 | 0.4 | 9 | 72.9 | | 0.26 |
| **456** | 186 | 0.89 | 20.8 | 0.4 | 8 | 62.2 | | 0.24 |
| **457** | 169 | 0.81 | 23.2 | 0.5 | 7 | 55 | | 0.26 |
| **458** | 165 | 1.12 | 34.3 | 0.3 | 8 | 22.2 | | 0.3 |
| **459** | 258 | 0.77 | 22.3 | 0.3 | 8 | 60.5 | | 0.25 |

| **Element** | **Ca** | **Cd** | **Ce** | **Co** | **Cr** | **Cs** | **Cu** | **Fe** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **0.01** | **0.1** | **0.1** | **0.5** | **0.02** | **0.01** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **407** | 1.48 | 0.13 | | 10.9 | 21.4 | | 27.42 | 12.03 |
| **408** | 0.28 | 0.16 | | 17 | 31.1 | | 41.66 | 2.72 |
| **410** | 2.48 | 0.24 | | 6.5 | 18.1 | | 18.27 | 17.37 |
| **411** | 0.81 | 0.58 | | 14.8 | 31.6 | | 46.8 | 3.63 |
| **412** | 3.31 | 0.38 | | 8.3 | 20.8 | | 14.73 | 8.98 |
| **414** | 0.26 | 0.2 | | 16.7 | 31.3 | | 32 | 1.84 |
| **415** | 0.27 | 0.15 | | 16.1 | 28.6 | | 29.41 | 2.08 |
| **417** | 2.39 | 0.25 | | 8.4 | 19.4 | | 21.51 | 17.38 |
| **418** | 0.68 | 0.38 | | 13.6 | 27.9 | | 39.72 | 4.68 |
| **419** | 0.75 | 0.59 | | 15.7 | 28.8 | | 47.9 | 5.15 |
| **420** | 0.38 | 0.4 | | 14.9 | 29.9 | | 42.59 | 2.27 |
| **421** | 0.61 | 0.49 | | 13.1 | 29.5 | | 43.96 | 3.86 |
| **423** | 1.03 | 0.43 | | 14.9 | 21.2 | | 11.68 | 1.62 |
| **424** | 1.24 | 0.38 | | 10.2 | 21 | | 10.37 | 1.43 |
| **425** | 10.23 | 0.25 | | 7.1 | 15.2 | | 7.69 | 1.53 |
| **426** | 11.06 | 0.18 | | 7 | 12.7 | | 5.91 | 1.98 |
| **427** | 11.93 | 0.22 | | 6.9 | 14.7 | | 6.43 | 1.89 |
| **429** | 11.8 | 0.33 | | 7.3 | 18.8 | | 7.15 | 1.96 |
| **430** | 11.25 | 0.21 | | 6.2 | 13.6 | | 6.71 | 1.49 |
| **432** | 0.58 | 0.64 | | 12.8 | 26.7 | | 49.67 | 3.23 |
| **434** | 0.34 | 0.21 | | 15.6 | 31.1 | | 38.79 | 2.11 |
| **435** | 0.74 | 0.42 | | 11.8 | 27.4 | | 24.47 | 4.64 |
| **436** | 0.44 | 0.75 | | 17.5 | 30.8 | | 52.58 | 2.88 |
| **437** | 0.45 | 2.24 | | 14.2 | 26.4 | | 48.77 | 2.92 |
| **438** | 2.91 | 1.03 | | 16.2 | 13.3 | | 37.91 | 2.85 |
| **439** | 4.02 | 1.19 | | 16.1 | 10.7 | | 39.54 | 2.95 |
| **440** | 4.88 | 1.41 | | 17 | 10.8 | | 43.06 | 3.19 |
| **442** | 3.8 | 2.15 | | 16.6 | 11.9 | | 42 | 2.89 |
| **443** | 4.57 | 2.1 | | 17.8 | 10.9 | | 41.16 | 3 |
| **445** | 5.33 | 1.38 | | 15.5 | 9.3 | | 38.6 | 2.86 |
| **446** | 16.66 | 0.36 | | 5.2 | 9.3 | | 13.27 | 4.26 |
| **447** | 3.8 | 0.97 | | 13.5 | 10.3 | | 33.78 | 2.55 |
| **448** | 2.44 | 0.77 | | 12.9 | 10.6 | | 31.7 | 2.53 |
| **449** | 2.1 | 0.66 | | 13.2 | 12.3 | | 32.41 | 2.66 |
| **450** | 2.37 | 1.12 | | 14.1 | 13 | | 33.71 | 2.75 |
| **451** | 2.31 | 0.84 | | 14.3 | 13.6 | | 31.72 | 2.75 |
| **452** | 1.86 | 0.68 | | 14.2 | 14.1 | | 33.04 | 2.77 |
| **453** | 2.6 | 1.05 | | 13.7 | 14.4 | | 31.91 | 2.93 |
| **454** | 3.84 | 0.62 | | 11.6 | 14.5 | | 30.39 | 3.13 |
| **455** | 4.09 | 0.74 | | 12.4 | 13.9 | | 29.91 | 2.93 |
| **456** | 2.21 | 0.42 | | 12 | 15.2 | | 26.99 | 2.96 |
| **457** | 2.36 | 0.44 | | 12.3 | 14.1 | | 26.02 | 3.05 |
| **458** | 1.23 | 0.45 | | 10.9 | 9.9 | | 35.04 | 5.58 |
| **459** | 1.9 | 0.84 | | 13.8 | 13.1 | | 34.38 | 3.15 |

| **Element** | **Ga** | **Ge** | **Hf** | **Hg** | **In** | **K** | **La** | **Li** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **0.02** | **5** | **0.02** | **0.01** | **0.5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppb** | **ppm** | **%** | **ppm** | **ppm** |
| **407** | 3.4 | | | 194 | | 0.18 | 14.8 | |
| **408** | 5.6 | | | 283 | | 0.32 | 15.8 | |
| **410** | 2.6 | | | 58 | | 0.13 | 16.4 | |
| **411** | 6 | | | 130 | | 0.31 | 20.2 | |
| **412** | 3.4 | | | 122 | | 0.13 | 12 | |
| **414** | 5.5 | | | 223 | | 0.25 | 19.7 | |
| **415** | 5.3 | | | 229 | | 0.22 | 18.5 | |
| **417** | 2.8 | | | 89 | | 0.12 | 15.9 | |
| **418** | 4.7 | | | 143 | | 0.21 | 16.4 | |
| **419** | 4.8 | | | 196 | | 0.22 | 17.1 | |
| **420** | 5.2 | | | 258 | | 0.25 | 16.4 | |
| **421** | 5.1 | | | 194 | | 0.23 | 16.8 | |
| **423** | 3 | | | 179 | | 0.1 | 15.7 | |
| **424** | 2.6 | | | 130 | | 0.09 | 18.3 | |
| **425** | 2.3 | | | 55 | | 0.07 | 13.1 | |
| **426** | 1.8 | | | 43 | | 0.07 | 8.5 | |
| **427** | 1.8 | | | 31 | | 0.07 | 10.2 | |
| **429** | 2.1 | | | 40 | | 0.08 | 18.6 | |
| **430** | 2 | | | 59 | | 0.07 | 7 | |
| **432** | 5.5 | | | 216 | | 0.27 | 15.5 | |
| **434** | 5.5 | | | 187 | | 0.25 | 18.1 | |
| **435** | 4 | | | 118 | | 0.17 | 14.3 | |
| **436** | 6 | | | 156 | | 0.22 | 17.5 | |
| **437** | 4.7 | | | 191 | | 0.22 | 14.9 | |
| **438** | 2.2 | | | 99 | | 0.24 | 3.2 | |
| **439** | 1.9 | | | 94 | | 0.21 | 3.1 | |
| **440** | 1.9 | | | 101 | | 0.19 | 3.2 | |
| **442** | 1.9 | | | 80 | | 0.21 | 2.8 | |
| **443** | 1.9 | | | 90 | | 0.2 | 2.9 | |
| **445** | 1.7 | | | 82 | | 0.19 | 3.2 | |
| **446** | 0.7 | | | 34 | | 0.09 | 2.6 | |
| **447** | 1.8 | | | 70 | | 0.21 | 3.3 | |
| **448** | 1.8 | | | 71 | | 0.2 | 2.8 | |
| **449** | 2.1 | | | 65 | | 0.22 | 2.8 | |
| **450** | 2 | | | 86 | | 0.21 | 3 | |
| **451** | 2.1 | | | 58 | | 0.22 | 2.7 | |
| **452** | 2.2 | | | 67 | | 0.22 | 2.7 | |
| **453** | 2.2 | | | 76 | | 0.23 | 2.6 | |
| **454** | 2.2 | | | 63 | | 0.23 | 3.6 | |
| **455** | 2.2 | | | 65 | | 0.21 | 3.5 | |
| **456** | 2.4 | | | 59 | | 0.26 | 2.8 | |
| **457** | 2.3 | | | 63 | | 0.22 | 2.6 | |
| **458** | 2.4 | | | 60 | | 0.21 | 2.9 | |
| **459** | 2.2 | | | 62 | | 0.22 | 3.1 | |

| Element | Mg | Mn | Mo | Na | Nb | Ni | P | Pb |
|---|---|---|---|---|---|---|---|---|
| LDL | 0.01 | 1 | 0.01 | 0.001 | 0.02 | 0.1 | 0.001 | 0.01 |
| Samples | % | ppm | ppm | % | ppm | ppm | % | ppm |
| 407 | 1.8 | 1042 | 0.72 | 0.193 |  | 24.7 | 0.087 | 12.94 |
| 408 | 0.53 | 181 | 0.68 | 0.341 |  | 43.1 | 0.106 | 19.73 |
| 410 | 2.6 | 3074 | 0.83 | 0.132 |  | 21.1 | 0.11 | 7.46 |
| 411 | 0.67 | 966 | 1.58 | 0.334 |  | 52.9 | 0.23 | 17.75 |
| 412 | 1.56 | 1144 | 0.73 | 0.116 |  | 26 | 0.102 | 10.07 |
| 414 | 0.47 | 296 | 0.73 | 0.28 |  | 49.6 | 0.087 | 15.83 |
| 415 | 0.44 | 352 | 0.74 | 0.25 |  | 43.6 | 0.076 | 14.23 |
| 417 | 2.55 | 2174 | 1.3 | 0.139 |  | 24.9 | 0.09 | 7.49 |
| 418 | 0.85 | 751 | 1.33 | 0.238 |  | 39.6 | 0.1 | 13.2 |
| 419 | 0.93 | 745 | 2.17 | 0.259 |  | 50 | 0.093 | 13.99 |
| 420 | 0.56 | 322 | 2.56 | 0.273 |  | 53.5 | 0.088 | 14.67 |
| 421 | 0.68 | 726 | 1.18 | 0.267 |  | 38.3 | 0.108 | 14.43 |
| 423 | 0.49 | 240 | 1.06 | 0.082 |  | 50 | 0.064 | 6.44 |
| 424 | 0.51 | 237 | 0.44 | 0.055 |  | 31.6 | 0.063 | 7.24 |
| 425 | 0.56 | 402 | 0.16 | 0.054 |  | 24.5 | 0.048 | 4.53 |
| 426 | 0.68 | 378 | 0.11 | 0.054 |  | 23.8 | 0.042 | 3.85 |
| 427 | 0.66 | 466 | 0.13 | 0.057 |  | 24.8 | 0.047 | 3.7 |
| 429 | 0.71 | 468 | 0.11 | 0.062 |  | 27 | 0.057 | 3.72 |
| 430 | 0.64 | 365 | 0.11 | 0.052 |  | 23.1 | 0.039 | 3.67 |
| 432 | 0.59 | 648 | 2.22 | 0.355 |  | 49 | 0.09 | 16.27 |
| 434 | 0.46 | 275 | 1.02 | 0.336 |  | 43 | 0.087 | 16.79 |
| 435 | 0.9 | 599 | 1.32 | 0.19 |  | 38.8 | 0.099 | 9.03 |
| 436 | 0.62 | 465 | 2.43 | 0.309 |  | 77 | 0.086 | 15.97 |
| 437 | 0.54 | 436 | 1.87 | 0.275 |  | 49.8 | 0.079 | 13.23 |
| 438 | 0.41 | 79 | 14.71 | 0.2 |  | 60 | 0.065 | 14.43 |
| 439 | 0.41 | 66 | 18.43 | 0.179 |  | 64.1 | 0.063 | 14.9 |
| 440 | 0.48 | 87 | 21.93 | 0.173 |  | 60.3 | 0.065 | 14.48 |
| 442 | 0.4 | 61 | 16.47 | 0.174 |  | 73.5 | 0.063 | 14.55 |
| 443 | 0.42 | 58 | 20.41 | 0.168 |  | 76.9 | 0.061 | 13.99 |
| 445 | 0.44 | 71 | 20.76 | 0.157 |  | 63.2 | 0.062 | 13.49 |
| 446 | 5.37 | 449 | 5.97 | 0.055 |  | 16.6 | 0.038 | 4.51 |
| 447 | 0.73 | 73 | 11.33 | 0.169 |  | 53.2 | 0.075 | 14.52 |
| 448 | 0.64 | 70 | 8.66 | 0.193 |  | 50.1 | 0.069 | 13.7 |
| 449 | 0.63 | 76 | 7.28 | 0.196 |  | 49.5 | 0.07 | 14.58 |
| 450 | 0.68 | 90 | 8.12 | 0.2 |  | 51.4 | 0.073 | 15.19 |
| 451 | 0.65 | 73 | 7.68 | 0.208 |  | 50.1 | 0.069 | 13.94 |
| 452 | 0.59 | 75 | 6.87 | 0.212 |  | 48.3 | 0.073 | 13.93 |
| 453 | 0.55 | 68 | 7.35 | 0.202 |  | 51.7 | 0.061 | 14.23 |
| 454 | 0.65 | 100 | 5.57 | 0.187 |  | 38.3 | 0.075 | 15.25 |
| 455 | 0.59 | 85 | 5.39 | 0.21 |  | 43.6 | 0.072 | 15.28 |
| 456 | 0.55 | 86 | 2.69 | 0.211 |  | 35.8 | 0.067 | 14.99 |
| 457 | 0.5 | 78 | 2.64 | 0.203 |  | 35.4 | 0.064 | 14.66 |
| 458 | 0.36 | 141 | 10.92 | 0.214 |  | 24 | 0.077 | 18.42 |
| 459 | 0.65 | 107 | 3.75 | 0.193 |  | 41.7 | 0.076 | 15.21 |

| **Element** | **Pd** | **Pt** | **Rb** | **Re** | **S** | **Sb** | **Sc** | **Se** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **10** | **2** | **0.1** | **1** | **0.02** | **0.02** | **0.1** | **0.1** |
| **Samples** | **ppb** | **ppb** | **ppm** | **ppb** | **%** | **ppm** | **ppm** | **ppm** |
| **407** | | | | | 1.22 | 0.45 | 9.6 | 0.7 |
| **408** | | | | | 1.37 | 0.62 | 6.5 | 0.8 |
| **410** | | | | | 0.25 | 0.29 | 13.1 | 0.7 |
| **411** | | | | | 0.54 | 0.49 | 5.5 | 1.2 |
| **412** | | | | | 0.46 | 0.97 | 6.7 | 0.8 |
| **414** | | | | | 0.15 | 0.63 | 5 | 1 |
| **415** | | | | | 0.15 | 0.89 | 5 | 0.7 |
| **417** | | | | | 0.02 | 0.38 | 24.5 | 0.7 |
| **418** | | | | | 0.09 | 0.58 | 7.8 | 1.2 |
| **419** | | | | | 0.06 | 0.71 | 9 | 1.2 |
| **420** | | | | | 0.21 | 0.98 | 5.5 | 1.2 |
| **421** | | | | | 0.07 | 0.58 | 7.7 | 1.5 |
| **423** | | | | | 0.2 | 0.84 | 3.1 | 0.4 |
| **424** | | | | | 0.15 | 0.75 | 2.9 | 0.3 |
| **425** | | | | | 0.01 | 0.32 | 2.5 | 0.4 |
| **426** | | | | | 0.02 | 0.23 | 2.6 | 0.3 |
| **427** | | | | | 0.03 | 0.25 | 2.7 | 0.3 |
| **429** | | | | | 0.04 | 0.27 | 2.7 | 0.4 |
| **430** | | | | | 0.02 | 0.24 | 1.9 | 0.4 |
| **432** | | | | | 0.13 | 0.64 | 6.6 | 1.4 |
| **434** | | | | | 0.38 | 1.21 | 5.4 | 1.2 |
| **435** | | | | | 0.05 | 0.61 | 6.1 | 0.8 |
| **436** | | | | | 0.07 | 0.94 | 6.2 | 1.2 |
| **437** | | | | | 0.13 | 1.49 | 6.1 | 1.3 |
| **438** | | | | | 2.56 | 1.2 | 4.4 | 3.2 |
| **439** | | | | | 2.78 | 1.15 | 5.3 | 3.6 |
| **440** | | | | | 3.04 | 1.19 | 5.1 | 3.8 |
| **442** | | | | | 2.73 | 1.46 | 5.1 | 4.3 |
| **443** | | | | | 2.88 | 1.7 | 5.2 | 4.5 |
| **445** | | | | | 2.85 | 1.27 | 5 | 3.8 |
| **446** | | | | | 1.06 | 0.51 | 2.2 | 1.4 |
| **447** | | | | | 2.39 | 1.23 | 4.6 | 3 |
| **448** | | | | | 2.28 | 1.15 | 4.5 | 2.3 |
| **449** | | | | | 2.28 | 0.88 | 4.7 | 2.1 |
| **450** | | | | | 2.4 | 1.04 | 5 | 2.3 |
| **451** | | | | | 2.41 | 1.01 | 5.1 | 2.2 |
| **452** | | | | | 2.43 | 0.93 | 5.1 | 2.1 |
| **453** | | | | | 2.53 | 0.97 | 5.2 | 2.3 |
| **454** | | | | | 2.84 | 0.87 | 6 | 2.1 |
| **455** | | | | | 2.48 | 0.74 | 6 | 1.8 |
| **456** | | | | | 2.46 | 0.55 | 5.1 | 1.6 |
| **457** | | | | | 2.6 | 0.63 | 5.1 | 1.5 |
| **458** | | | | | 6.05 | 0.87 | 3.7 | 2 |
| **459** | | | | | 2.72 | 0.95 | 4.7 | 2.2 |

| **Element** | **Sn** | **Sr** | **Ta** | **Te** | **Th** | **Ti** | **Tl** | **U** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.5** | **0.05** | **0.02** | **0.1** | **0.001** | **0.02** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **407** | | 88.9 | | 0.06 | 4.9 | 0.003 | 0.14 | 1.32 |
| **408** | | 93.8 | | 0.1 | 7.8 | 0.003 | 0.12 | 1.48 |
| **410** | | 108.2 | | 0.04 | 3.2 | 0.002 | 0.07 | 1.53 |
| **411** | | 136.7 | | 0.06 | 7.8 | 0.004 | 0.1 | 1.68 |
| **412** | | 185.3 | | 0.02 | 3.5 | 0.015 | 0.1 | 0.98 |
| **414** | | 77.6 | | 0.07 | 7.4 | 0.007 | 0.1 | 1.37 |
| **415** | | 68.5 | | 0.03 | 7.5 | 0.003 | 0.1 | 1.46 |
| **417** | | 106 | | < .02 | 3.4 | 0.004 | 0.06 | 1.79 |
| **418** | | 89.8 | | 0.03 | 6.7 | 0.005 | 0.1 | 1.52 |
| **419** | | 94.2 | | 0.04 | 6.9 | < .001 | 0.1 | 1.52 |
| **420** | | 79.6 | | 0.05 | 7.1 | < .001 | 0.12 | 1.48 |
| **421** | | 94.3 | | 0.04 | 7 | 0.003 | 0.1 | 1.73 |
| **423** | | 66.2 | | < .02 | 5.6 | 0.007 | 0.12 | 0.88 |
| **424** | | 75.9 | | < .02 | 5.4 | 0.015 | 0.12 | 0.94 |
| **425** | | 263 | | 0.03 | 3.7 | 0.01 | 0.06 | 0.64 |
| **426** | | 267.6 | | < .02 | 2.4 | < .001 | 0.05 | 0.51 |
| **427** | | 269.5 | | < .02 | 3 | 0.006 | 0.05 | 0.55 |
| **429** | | 287.4 | | < .02 | 4.7 | 0.012 | 0.06 | 0.65 |
| **430** | | 304.7 | | < .02 | 2.1 | 0.007 | 0.06 | 0.48 |
| **432** | | 112.8 | | 0.07 | 7 | 0.002 | 0.12 | 1.47 |
| **434** | | 93 | | 0.06 | 7.5 | 0.008 | 0.12 | 1.4 |
| **435** | | 73.6 | | < .02 | 5 | < .001 | 0.09 | 1.25 |
| **436** | | 98.9 | | 0.03 | 7.4 | < .001 | 0.14 | 1.57 |
| **437** | | 88 | | 0.03 | 6.2 | 0.004 | 0.13 | 1.67 |
| **438** | | 96.6 | | 0.06 | 4.2 | 0.004 | 0.17 | 2.06 |
| **439** | | 114.4 | | 0.09 | 4.1 | 0.001 | 0.2 | 2.75 |
| **440** | | 135.3 | | 0.08 | 4.1 | < .001 | 0.21 | 3.59 |
| **442** | | 103.3 | | 0.1 | 4.1 | < .001 | 0.28 | 2.51 |
| **443** | | 115.1 | | 0.1 | 4 | < .001 | 0.26 | 3 |
| **445** | | 141.7 | | 0.08 | 4 | 0.005 | 0.15 | 3.12 |
| **446** | | 239.7 | | 0.02 | 1.5 | 0.001 | 0.1 | 2.07 |
| **447** | | 101.2 | | 0.09 | 4.6 | 0.006 | 0.21 | 1.9 |
| **448** | | 83.9 | | 0.07 | 4.2 | 0.003 | 0.23 | 1.4 |
| **449** | | 78.9 | | 0.06 | 4.3 | 0.007 | 0.2 | 1.26 |
| **450** | | 83.3 | | 0.1 | 4.6 | < .001 | 0.25 | 1.52 |
| **451** | | 82.8 | | 0.07 | 4.1 | < .001 | 0.19 | 1.33 |
| **452** | | 78 | | 0.06 | 4.4 | < .001 | 0.17 | 1.33 |
| **453** | | 94.3 | | 0.05 | 4.2 | < .001 | 0.18 | 1.28 |
| **454** | | 106.3 | | 0.11 | 4.8 | < .001 | 0.11 | 1.7 |
| **455** | | 124.6 | | 0.09 | 4.6 | < .001 | 0.15 | 1.61 |
| **456** | | 87 | | 0.07 | 4.6 | < .001 | 0.07 | 1.17 |
| **457** | | 89.6 | | 0.06 | 4.5 | < .001 | 0.08 | 1.01 |
| **458** | | 60.1 | | 0.08 | 4.5 | < .001 | 0.17 | 1.06 |
| **459** | | 77.7 | | 0.1 | 5 | < .001 | 0.12 | 1.48 |

***Analysis: GROUP 1EX - 0.25 GM***

| **Element** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ag** | **Al** | **As** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.1** | **0.01** | **0.1** | **0.1** | **0.1** | **0.01** | **1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** |
| **407** | 40 | <.1 | | 83.8 | | | | |
| **408** | 44 | <.1 | | 141.7 | | | | |
| **410** | 61 | <.1 | | 54.2 | | | | |
| **411** | 50 | <.1 | | 160.6 | | | | |
| **412** | 42 | <.1 | | 102.5 | | | | |
| **414** | 42 | <.1 | | 140.3 | | | | |
| **415** | 42 | <.1 | | 118.7 | | | | |
| **417** | 64 | <.1 | | 82.8 | | | | |
| **418** | 45 | <.1 | | 128.2 | | | | |
| **419** | 46 | <.1 | | 137.5 | | | | |
| **420** | 42 | <.1 | | 153.7 | | | | |
| **421** | 45 | <.1 | | 145.1 | | | | |
| **423** | 31 | <.1 | | 88.8 | | | | |
| **424** | 30 | <.1 | | 82.8 | | | | |
| **425** | 22 | <.1 | | 54.9 | | | | |
| **426** | 21 | <.1 | | 50.1 | | | | |
| **427** | 22 | <.1 | | 49.9 | | | | |
| **429** | 26 | <.1 | | 60.5 | | | | |
| **430** | 21 | <.1 | | 50.7 | | | | |
| **432** | 44 | <.1 | | 163.4 | | | | |
| **434** | 48 | <.1 | | 131 | | | | |
| **435** | 41 | <.1 | | 109.9 | | | | |
| **436** | 46 | <.1 | | 166.1 | | | | |
| **437** | 47 | <.1 | | 176.2 | | | | |
| **438** | 41 | <.1 | | 138.3 | | | | |
| **439** | 38 | <.1 | | 146.7 | | | | |
| **440** | 35 | <.1 | | 157.4 | | | | |
| **442** | 47 | <.1 | | 181.5 | | | | |
| **443** | 45 | <.1 | | 192.2 | | | | |
| **445** | 36 | <.1 | | 150.2 | | 0.4 | 7.06 | 38 |
| **446** | 49 | <.1 | | 49.6 | | | | |
| **447** | 37 | <.1 | | 126.3 | | | | |
| **448** | 31 | <.1 | | 116.8 | | | | |
| **449** | 28 | <.1 | | 117.4 | | | | |
| **450** | 31 | <.1 | | 172 | | | | |
| **451** | 31 | <.1 | | 146.4 | | | | |
| **452** | 27 | <.1 | | 125.3 | | | | |
| **453** | 32 | <.1 | | 181.2 | | | | |
| **454** | 29 | <.1 | | 107.3 | | 0.3 | 7.13 | 32 |
| **455** | 28 | <.1 | | 143.1 | | | | |
| **456** | 25 | <.1 | | 101.1 | | | | |
| **457** | 23 | <.1 | | 119.1 | | | | |
| **458** | 21 | <.1 | | 85.4 | | | | |
| **459** | 25 | <.1 | | 140.3 | | | | |

| **Element** | **Au** | **Ba** | **Be** | **Bi** | **Ca** | **Cd** | **Ce** | **Co** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **1** | **1** | **0.1** | **0.01** | **0.1** | **1** | **1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **ppm** |
| **445** | <.1 | 118 | 2 | 0.2 | 6.01 | 1.4 | 63 | 17 |
| **454** | <.1 | 234 | 2 | 0.3 | 4.13 | 0.6 | 68 | 14 |

| **Element** | **Cr** | **Cu** | **Fe** | **Hf** | **K** | **La** | **Li** | **Mg** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **0.01** | **0.1** | **0.01** | **0.1** | **0.1** | **0.01** |
| **Samples** | **ppm** | **ppm** | **%** | **ppm** | **%** | **ppm** | **ppm** | **%** |
| **445** | 109.6 | 35.8 | 3.95 | 2 | 1.99 | 37.6 | 54 | 0.78 |
| **454** | 116.3 | 31.6 | 4.29 | 1.9 | 2.18 | 41.8 | 74.8 | 1 |

| **Element** | **Mn** | **Mo** | **Na** | **Nb** | **Ni** | **P** | **Pb** | **Rb** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **1** | **0.1** | **0.001** | **0.1** | **0.1** | **0.001** | **0.1** | **0.1** |
| **Samples** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **445** | 89 | 23.3 | 0.328 | 12.3 | 65.9 | 0.083 | 17 | 108.5 |
| **454** | 107 | 6.2 | 0.382 | 13.3 | 44.2 | 0.097 | 19.5 | 123.1 |

| **Element** | **S** | **Sb** | **Sc** | **Sn** | **Sr** | **Ta** | **Th** | **Ti** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **1** | **0.1** | **1** | **0.1** | **0.1** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **445** | 3 | 2.6 | 12 | 2.2 | 228 | 0.8 | 9.1 | 0.395 |
| **454** | 2.8 | 1.5 | 14 | 2.5 | 208 | 0.9 | 10.7 | 0.425 |

***Analysis: GROUP 4B - REE - 0.200 GM***

| **Element** | **U** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ce** | **Co** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **1** | **0.1** | **0.1** | **1** | **0.1** | **0.5** | **0.5** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **445** | 6.9 | 293 | 1.1 | 18.7 | 192 | 57 | 75.1 | 18.9 |
| **454** | 4.5 | 237 | 1.5 | 20.3 | 129 | 55.7 | 86.2 | 12.6 |

| **Element** | **Cs** | **Dy** | **Er** | **Eu** | **Ga** | **Gd** | **Hf** | **Ho** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.05** | **0.05** | **0.05** | **0.5** | **0.05** | **0.5** | **0.05** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **445** | 8.7 | 4.27 | 2.42 | 1.11 | 18.8 | 4.31 | 3.3 | 0.8 |
| **454** | 9.6 | 4.95 | 2.62 | 1.32 | 20.6 | 5.3 | 3.7 | 1 |

| **Element** | **La** | **Lu** | **Nb** | **Nd** | **Pr** | **Sn** | **Rb** | **Sm** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.5** | **0.01** | **0.5** | **0.4** | **0.02** | **1** | **0.5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **445** | 37 | 0.38 | 16.2 | 29.9 | 8.86 | < 1 | 126.6 | 5.9 |
| **454** | 42.1 | 0.37 | 17.4 | 35.9 | 9.66 | 2 | 140.6 | 6.2 |

| **Element** | **Sr** | **Ta** | **Tb** | **Th** | **Tm** | **U** | **V** | **W** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.5** | **0.1** | **0.01** | **0.1** | **0.05** | **0.1** | **5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **445** | 284.4 | 1 | 0.72 | 10.5 | 0.4 | 8.6 | 305 | 1.5 |
| **454** | 239.2 | 1.1 | 0.86 | 12.6 | 0.42 | 5.4 | 240 | 1.9 |

| | | | | ***Analysis: GROUP 4A - 0.200 GM*** | | | | |
|---|---|---|---|---|---|---|---|---|
| **Element** | **Y** | **Yb** | **Zr** | **Al2O3** | **Ba** | **CaO** | **Cr2O3** | **Cr2O3** |
| **LDL** | **0.1** | **0.05** | **0.5** | **0.03** | **5** | **0.01** | **0.001** | **0.001** |
| **Samples** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **%** | **%** | **%** |
| **445** | 27.5 | 2.46 | 116 | 14.15 | 1002.6 | 8.8 | 0.01 | |
| **454** | 29.6 | 2.59 | 130.8 | 14.78 | 938.4 | 5.89 | 0.013 | |

| **Element** | **Fe2O3** | **K2O** | **LOI** | **MgO** | **MnO** | **Na2O** | **Ni** | **P2O5** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.04** | **0.04** | **0.1** | **0.01** | **0.01** | **0.01** | **30** | **0.01** |
| **Samples** | **%** | **%** | **%** | **%** | **%** | **%** | **ppm** | **%** |
| **445** | 5.47 | 2.6 | 15.6 | 1.49 | 0.01 | 0.51 | 60 | 0.19 |
| **454** | 5.77 | 2.72 | 12.8 | 1.91 | 0.01 | 0.52 | 35 | 0.21 |

| | | | | | | | ***Analysis: CO2*** | |
|---|---|---|---|---|---|---|---|---|
| **Element** | **Sc** | **SiO2** | **TiO2** | **TOT/C** | **TOT/S** | **SUM** | **C/ORG** | **C/GRA** |
| **LDL** | **1** | **0.02** | **0.01** | **0.01** | **0.01** | | | |
| **Samples** | **ppm** | **%** | **%** | **%** | **%** | **%** | **%** | **%** |
| **445** | 13 | 50.11 | 0.65 | 5.54 | 3.23 | 99.6 | 3.53 | 0.09 |
| **454** | 15 | 54.17 | 0.69 | 4.29 | 3.22 | 99.49 | 2.8 | 0.05 |

| **Element** | **CO2** | **SO4** |
|---|---|---|
| **LDL** | | |
| **Samples** | **%** | **%** |
| **445** | 7.05 | 2.61 |
| **454** | 5.29 | 2.3 |

| Samples | Hole | Latitude | Longitude | From (m) | To (m) | Analysis Date |
|---|---|---|---|---|---|---|
| **460** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1968.490 | 1968.460 | Dec. 2003 |
| **461** | 02/07-33-052-15W5/0 | 53.533243 | -116.145474 | 1969.130 | 1969.180 | Dec. 2003 |
| **462** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2237.600 | 2237.640 | Dec. 2003 |
| **463** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2238.620 | 2238.660 | Dec. 2003 |
| **464** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2239.610 | 2239.660 | Dec. 2003 |
| **465** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2240.200 | 2240.220 | Dec. 2003 |
| **466** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2240.590 | 2240.630 | Dec. 2003 |
| **467** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2241.590 | 2241.630 | Dec. 2003 |
| **468** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2242.600 | 2242.640 | Dec. 2003 |
| **470** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2243.570 | 2243.610 | Dec. 2003 |
| **471** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2243.580 | 2243.580 | Dec. 2003 |
| **472** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2244.580 | 2244.650 | Dec. 2003 |
| **473** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2245.600 | 2245.640 | Dec. 2003 |
| **475** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2246.520 | 2246.580 | Dec. 2003 |
| **476** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2247.570 | 2247.620 | Dec. 2003 |
| **477** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2248.550 | 2248.600 | Dec. 2003 |
| **478** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2248.750 | 2248.800 | Dec. 2003 |
| **479** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2249.560 | 2249.600 | Dec. 2003 |
| **480** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2250.560 | 2250.610 | Dec. 2003 |
| **481** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2251.500 | 2251.540 | Dec. 2003 |
| **482** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2252.550 | 2252.600 | Dec. 2003 |
| **483** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2253.580 | 2253.640 | Dec. 2003 |
| **484** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2255.790 | 2255.830 | Dec. 2003 |
| **485** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2256.790 | 2256.835 | Dec. 2003 |
| **486** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2256.960 | 2256.960 | Dec. 2003 |
| **487** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2257.810 | 2257.850 | Dec. 2003 |
| **488** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2258.810 | 2258.860 | Dec. 2003 |
| **489** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2259.900 | 2259.950 | Dec. 2003 |
| **490** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2260.920 | 2260.960 | Dec. 2003 |
| **491** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2261.910 | 2261.960 | Dec. 2003 |
| **492** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2262.900 | 2262.950 | Dec. 2003 |
| **493** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2263.880 | 2263.920 | Dec. 2003 |
| **494** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2264.910 | 2264.960 | Dec. 2003 |
| **496** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2265.920 | 2265.960 | Dec. 2003 |
| **497** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2266.870 | 2266.920 | Dec. 2003 |
| **498** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2267.020 | 2267.075 | Dec. 2003 |
| **499** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2267.960 | 2268.010 | Dec. 2003 |
| **500** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2268.900 | 2268.950 | Dec. 2003 |
| **3807** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2269.910 | 2269.960 | Dec. 2003 |
| **3808** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2270.890 | 2270.940 | Dec. 2003 |
| **3809** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2270.890 | 2270.910 | Dec. 2003 |
| **3810** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2271.880 | 2271.930 | Dec. 2003 |
| **3811** | 00/09-09-056-19W5/0 | 53.827446 | -116.755651 | 2272.880 | 2271.920 | Dec. 2003 |
| **3812** | 02/16-27-058-20W5/0 | 54.049053 | -116.877692 | 1825.465 | 1825.525 | Dec. 2003 |
| **3813** | 02/16-27-058-20W5/0 | 54.049053 | -116.877692 | 1826.500 | 1826.555 | Dec. 2003 |

| Samples | Probability of Fm | Formation | Sample Description |
|---|---|---|---|
| 460 | Unknown | Upper Belle Fourche | Dk grey shale, smooth, some silt, black organic debris |
| 461 | Unknown | Upper Belle Fourche | Dk grey shale, some silt |
| 462 | Unknown | Second White Specks | Broken fragments of dk grey shale, minor silt, shelly fragments |
| 463 | Unknown | Second White Specks | Broken fragments of dk grey shale, some silt and shelly debris |
| 464 | Unknown | Second White Specks | Broken fragments of dk grey shale, some silt, shelly remains |
| 465 | Unknown | Second White Specks | Pyritized shell |
| 466 | Unknown | Second White Specks | Broken fragments of dk grey shale, pyritized shell, minor silt, shelly fragments |
| 467 | Unknown | Second White Specks | Broken fragments of dk grey shale, some silt |
| 468 | Probable | Second White Specks | Broken fragments of shale, some silt, some shelly debris |
| 470 | Probable | Second White Specks | Broken fragments of dk grey shale, some silt |
| 471 | Probable | Second White Specks | Pyrite lense within carbonate + unidentified fossil |
| 472 | Probable | Second White Specks | Broken fragments of dk grey shale, smooth, a little silt |
| 473 | Probable | Second White Specks | Broken fragments of dk grey shale, some silt |
| 475 | Probable | Second White Specks | Broken fragments of dk grey shale, some silty lams/pockets - very calcareous |
| 476 | Probable | Second White Specks | Broken fragments of dk grey shale, some silt |
| 477 | Probable | Second White Specks | Broken fragments of dk grey shale, minor silt |
| 478 | Probable | Second White Specks | Calcareous lams full of pyrite |
| 479 | Probable | Second White Specks | Broken fragments of dk grey shale, some silt |
| 480 | Probable | Second White Specks | Broken fragments of dk grey shale, some silt and shelly debris |
| 481 | Probable | Second White Specks | Broken fragments of dk grey shale, silty lams, some shelly debris |
| 482 | Probable | Second White Specks | Broken fragments of dk grey shale, some silt |
| 483 | Probable | Second White Specks | Broken fragments of dk grey shale, some silt, micas |
| 484 | Probable | Second White Specks | Broken fragments of dk grey shale, some silt |
| 485 | Probable | Second White Specks | Broken fragments of dk grey shale, some silt |
| 486 | Probable | Second White Specks | Pyrite laminations |
| 487 | Probable | Second White Specks | Broken fragments of dk grey shale, some silt |
| 488 | Probable | Second White Specks | Broken fragments of dk grey shale, silty pockets |
| 489 | Probable | Second White Specks | Broken fragments of dk grey shale, silty pockets |
| 490 | Probable | Second White Specks | Broken fragments of dk grey shale, some silt |
| 491 | Probable | Second White Specks | Broken fragments of dk grey shale, silty pockets |
| 492 | Probable | Second White Specks | Broken fragments of dk grey shale, some silty pockets |
| 493 | Probable | Second White Specks | Broken fragments of dk grey shale, very smooth, a little silt |
| 494 | Probable | Second White Specks | Broken fragments of dk grey shale, some silt |
| 496 | Probable | Second White Specks | Broken fragments of dk grey shale, some silt, a few shelly fragments |
| 497 | Probable | Second White Specks | Broken fragments of smooth dk grey shale, little silt |
| 498 | Probable | Second White Specks | Calcite nodule? Pyrite rim |
| 499 | Probable | Second White Specks | Broken fragments of dk grey shale, very smooth, some silt |
| 500 | Probable | Second White Specks | Broken fragments of dk grey shale, some silt |
| 3807 | Probable | Second White Specks | Broken fragments of dk grey shale, some silt |
| 3808 | Possible | Second White Specks | Broken fragments of dk grey shale, some silt |
| 3809 | Possible | Second White Specks | Black vitreous lenses (coal?) |
| 3810 | Possible | Second White Specks | Broken fragments of dk grey shale, some silt |
| 3811 | Possible | Second White Specks | Broken fragments of dk grey shale, some silt |
| 3812 | Possible | Second White Specks | Dk grey shale, micas, silt lams, some shelly debris |
| 3813 | Possible | Second White Specks | Dk grey shale, micas, some silt |

***Analysis: GROUP 1F1 - 1.00 GM***

| **Element** | **Ag** | **Al** | **As** | **Au** | **B** | **Ba** | **Be** | **Bi** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** | **0.1** | **0.02** |
| **Samples** | **ppb** | **%** | **ppm** | **ppb** | **ppm** | **ppm** | **ppm** | **ppm** |
| **460** | 196 | 0.71 | 24.6 | 0.5 | 7 | 52.8 |  | 0.28 |
| **461** | 197 | 0.7 | 24.2 | 0.3 | 9 | 71.8 |  | 0.28 |
| **462** | 330 | 0.69 | 33.8 | 0.3 | 9 | 63 |  | 0.29 |
| **463** | 326 | 0.7 | 34 | 0.4 | 9 | 67.7 |  | 0.32 |
| **464** | 322 | 0.67 | 35.5 | 0.2 | 9 | 60.7 |  | 0.29 |
| **465** | 288 | 0.9 | 33.7 | < .2 | 12 | 65.3 |  | 0.28 |
| **466** | 333 | 0.67 | 33.8 | 0.3 | 9 | 57.1 |  | 0.36 |
| **467** | 297 | 0.68 | 31.5 | 0.8 | 10 | 73.6 |  | 0.3 |
| **468** | 404 | 0.58 | 37.3 | < .2 | 11 | 48.6 |  | 0.31 |
| **470** | 308 | 0.55 | 36.2 | 0.5 | 9 | 55.4 |  | 0.35 |
| **471** | 290 | 0.57 | 35.6 | 0.3 | 10 | 54.5 |  | 0.28 |
| **472** | 399 | 0.66 | 37.5 | 0.4 | 10 | 57.1 |  | 0.38 |
| **473** | 348 | 0.63 | 39.1 | 0.6 | 9 | 56.6 |  | 0.32 |
| **475** | 352 | 0.57 | 32.8 | 0.6 | 10 | 56.3 |  | 0.27 |
| **476** | 365 | 0.61 | 46.8 | < .2 | 8 | 47.4 |  | 0.3 |
| **477** | 375 | 0.56 | 37.3 | < .2 | 10 | 55.4 |  | 0.29 |
| **478** | 291 | 0.58 | 39.1 | 0.4 | 11 | 64 |  | 0.23 |
| **479** | 385 | 0.63 | 33 | 0.3 | 9 | 54.3 |  | 0.31 |
| **480** | 339 | 0.48 | 34.8 | 0.3 | 9 | 57.1 |  | 0.25 |
| **481** | 336 | 0.49 | 39.3 | 0.3 | 12 | 55.4 |  | 0.28 |
| **482** | 304 | 0.58 | 35.2 | 0.2 | 11 | 63 |  | 0.27 |
| **483** | 274 | 0.5 | 35.5 | 0.6 | 8 | 56.5 |  | 0.23 |
| **484** | 196 | 0.81 | 18.4 | 0.5 | 9 | 70.4 |  | 0.27 |
| **485** | 176 | 0.85 | 16.9 | < .2 | 10 | 77 |  | 0.29 |
| **486** | 165 | 1.24 | 17.3 | 0.3 | 12 | 39 |  | 0.52 |
| **487** | 170 | 0.86 | 19 | 0.7 | 9 | 62.7 |  | 0.28 |
| **488** | 169 | 0.73 | 21.8 | 0.7 | 9 | 49.7 |  | 0.26 |
| **489** | 176 | 0.75 | 21.8 | 0.2 | 9 | 58.6 |  | 0.27 |
| **490** | 181 | 0.83 | 22.1 | 0.7 | 10 | 53 |  | 0.27 |
| **491** | 194 | 0.68 | 22.3 | 0.7 | 8 | 49.9 |  | 0.24 |
| **492** | 209 | 0.74 | 22.1 | 0.3 | 9 | 47.9 |  | 0.25 |
| **493** | 212 | 0.71 | 19.1 | 0.6 | 9 | 50.8 |  | 0.26 |
| **494** | 205 | 0.67 | 23.1 | 0.2 | 7 | 45.2 |  | 0.27 |
| **496** | 278 | 0.68 | 30.2 | < .2 | 9 | 44.9 |  | 0.23 |
| **497** | 279 | 0.67 | 27.5 | 0.2 | 9 | 45.3 |  | 0.23 |
| **498** | 68 | 0.17 | 26.8 | < .2 | 3 | 120.3 |  | 0.05 |
| **499** | 281 | 0.66 | 25.2 | < .2 | 8 | 45.7 |  | 0.27 |
| **500** | 269 | 0.6 | 25.3 | 0.4 | 7 | 44.8 |  | 0.25 |
| **3807** | 263 | 0.57 | 20.2 | < .2 | 8 | 46 |  | 0.25 |
| **3808** | 244 | 0.65 | 22.4 | 0.3 | 7 | 42 |  | 0.28 |
| **3809** | 274 | 0.76 | 23.1 | < .2 | 8 | 39.5 |  | 0.28 |
| **3810** | 290 | 0.69 | 24 | 0.3 | 8 | 37.9 |  | 0.3 |
| **3811** | 226 | 0.73 | 18.7 | 0.3 | 8 | 44.7 |  | 0.28 |
| **3812** | 242 | 0.46 | 29.4 | 0.4 | 8 | 55.2 |  | 0.23 |
| **3813** | 268 | 0.58 | 29.9 | 0.3 | 7 | 43 |  | 0.28 |

| **Element** | **Ca** | **Cd** | **Ce** | **Co** | **Cr** | **Cs** | **Cu** | **Fe** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **0.01** | **0.1** | **0.1** | **0.5** | **0.02** | **0.01** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **460** | 2.14 | 0.69 | | 13.6 | 11.8 | | 29.54 | 3.3 |
| **461** | 3.31 | 1.23 | | 12.3 | 11.6 | | 28.85 | 3.02 |
| **462** | 4.08 | 1.34 | | 16.5 | 10.7 | | 38.85 | 3.18 |
| **463** | 3.56 | 1.25 | | 16.5 | 10.7 | | 40.08 | 2.99 |
| **464** | 3.79 | 1.21 | | 16.6 | 10.3 | | 41.12 | 3.14 |
| **465** | 4.77 | 1.45 | | 14.5 | 13.4 | | 34.82 | 3.09 |
| **466** | 3.8 | 1.07 | | 15.9 | 9.8 | | 38.91 | 3.12 |
| **467** | 2.61 | 1.25 | | 14.8 | 10.5 | | 38.13 | 2.56 |
| **468** | 4.83 | 1.28 | | 17.2 | 9.1 | | 44.52 | 3.13 |
| **470** | 4.56 | 0.92 | | 15.5 | 9.6 | | 38.97 | 2.95 |
| **471** | 4.9 | 1.21 | | 13.6 | 9.5 | | 33.85 | 3.35 |
| **472** | 3.47 | 1.76 | | 18.2 | 10.8 | | 47.39 | 3.14 |
| **473** | 3.95 | 1.24 | | 19 | 11.1 | | 43.47 | 3.24 |
| **475** | 4.99 | 1.25 | | 16 | 10.1 | | 41.7 | 3.21 |
| **476** | 3.17 | 1.35 | | 17.7 | 10.9 | | 41.94 | 3.3 |
| **477** | 4.9 | 1.69 | | 17.8 | 10.2 | | 42.32 | 3.16 |
| **478** | 7.15 | 1.37 | | 13.6 | 10.2 | | 32.15 | 3.13 |
| **479** | 3.1 | 1.76 | | 15.6 | 10.7 | | 42.13 | 2.67 |
| **480** | 7.05 | 1.21 | | 15.9 | 8.3 | | 37.39 | 2.89 |
| **481** | 5.86 | 1.14 | | 16.3 | 9.6 | | 37.61 | 2.95 |
| **482** | 5.66 | 1.11 | | 16 | 10 | | 35.68 | 2.9 |
| **483** | 5.65 | 1.38 | | 13.9 | 10.4 | | 30.18 | 3.39 |
| **484** | 1.4 | 0.45 | | 12.5 | 14.2 | | 28.95 | 2.77 |
| **485** | 1.56 | 0.78 | | 12.3 | 13.7 | | 28.23 | 2.81 |
| **486** | 1.09 | 0.41 | | 9.9 | 11.9 | | 23 | 3.92 |
| **487** | 1.33 | 0.45 | | 12.6 | 15.3 | | 27.28 | 2.84 |
| **488** | 1.84 | 0.47 | | 12.2 | 12.3 | | 27.47 | 3.16 |
| **489** | 1.7 | 0.44 | | 11.8 | 12.1 | | 28.01 | 3.15 |
| **490** | 1.86 | 0.47 | | 12.9 | 12.9 | | 28.14 | 3.16 |
| **491** | 2.15 | 0.6 | | 13 | 11.3 | | 30.15 | 3.02 |
| **492** | 1.92 | 0.72 | | 13 | 11.9 | | 30.25 | 3.26 |
| **493** | 1.79 | 0.98 | | 12.1 | 11.2 | | 28.73 | 2.92 |
| **494** | 2.45 | 1.09 | | 12.4 | 10.7 | | 29.67 | 3.04 |
| **496** | 3.12 | 1.38 | | 15.1 | 11.7 | | 36.11 | 3.32 |
| **497** | 2.78 | 1.29 | | 15.8 | 11.4 | | 38.05 | 3.22 |
| **498** | 22.29 | 0.58 | | 4.1 | 3.6 | | 9.16 | 4.87 |
| **499** | 2.62 | 1.59 | | 15.3 | 11.6 | | 42.5 | 3.29 |
| **500** | 4.41 | 1.28 | | 14.6 | 10.7 | | 38.84 | 3.49 |
| **3807** | 4.21 | 1.23 | | 13.7 | 10.2 | | 39.62 | 3.14 |
| **3808** | 2.21 | 1.16 | | 14.7 | 12.3 | | 38.48 | 3.1 |
| **3809** | 2.83 | 1.24 | | 15.2 | 13 | | 41.95 | 3.42 |
| **3810** | 2.26 | 1.66 | | 16.5 | 12.3 | | 42.32 | 3.4 |
| **3811** | 1.36 | 0.86 | | 14 | 11.5 | | 34.73 | 2.97 |
| **3812** | 5.76 | 1.02 | | 12.7 | 9.6 | | 29.08 | 2.91 |
| **3813** | 3.73 | 0.93 | | 15 | 10.7 | | 33.86 | 2.96 |

| **Element** | **Ga** | **Ge** | **Hf** | **Hg** | **In** | **K** | **La** | **Li** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **0.02** | **5** | **0.02** | **0.01** | **0.5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppb** | **ppm** | **%** | **ppm** | **ppm** |
| **460** | 2.1 | | | 69 | | 0.21 | 2.8 | |
| **461** | 2.1 | | | 74 | | 0.21 | 3.3 | |
| **462** | 2.1 | | | 106 | | 0.21 | 3.1 | |
| **463** | 2.1 | | | 100 | | 0.22 | 3.3 | |
| **464** | 2 | | | 111 | | 0.21 | 3.2 | |
| **465** | 2.6 | | | 121 | | 0.3 | 3.6 | |
| **466** | 2 | | | 101 | | 0.2 | 3.7 | |
| **467** | 2 | | | 74 | | 0.22 | 2.7 | |
| **468** | 1.8 | | | 105 | | 0.21 | 3.7 | |
| **470** | 1.6 | | | 106 | | 0.19 | 3.6 | |
| **471** | 1.6 | | | 84 | | 0.19 | 3.8 | |
| **472** | 2 | | | 106 | | 0.21 | 3.7 | |
| **473** | 1.9 | | | 123 | | 0.21 | 3.3 | |
| **475** | 1.7 | | | 89 | | 0.19 | 3.5 | |
| **476** | 1.8 | | | 101 | | 0.21 | 2.8 | |
| **477** | 1.7 | | | 111 | | 0.19 | 3.4 | |
| **478** | 1.7 | | | 95 | | 0.19 | 5.5 | |
| **479** | 1.7 | | | 85 | | 0.21 | 2.9 | |
| **480** | 1.5 | | | 89 | | 0.18 | 4.2 | |
| **481** | 1.6 | | | 95 | | 0.2 | 4 | |
| **482** | 1.7 | | | 103 | | 0.22 | 3.8 | |
| **483** | 1.5 | | | 72 | | 0.18 | 3.6 | |
| **484** | 2.4 | | | 72 | | 0.23 | 2.6 | |
| **485** | 2.5 | | | 68 | | 0.22 | 2.6 | |
| **486** | 2.8 | | | 48 | | 0.24 | 2.2 | |
| **487** | 2.4 | | | 74 | | 0.25 | 2.4 | |
| **488** | 2 | | | 83 | | 0.2 | 2.4 | |
| **489** | 2.1 | | | 62 | | 0.21 | 2.5 | |
| **490** | 2.3 | | | 69 | | 0.24 | 2.4 | |
| **491** | 2.1 | | | 71 | | 0.21 | 3 | |
| **492** | 2.2 | | | 66 | | 0.22 | 2.8 | |
| **493** | 2.1 | | | 58 | | 0.22 | 2.6 | |
| **494** | 2 | | | 68 | | 0.2 | 2.9 | |
| **496** | 2 | | | 62 | | 0.22 | 3.1 | |
| **497** | 2 | | | 80 | | 0.22 | 2.9 | |
| **498** | 0.5 | | | 43 | | 0.07 | 1.5 | |
| **499** | 2 | | | 92 | | 0.21 | 3.2 | |
| **500** | 1.8 | | | 74 | | 0.2 | 3.5 | |
| **3807** | 1.7 | | | 72 | | 0.19 | 3.3 | |
| **3808** | 1.9 | | | 77 | | 0.2 | 2.5 | |
| **3809** | 2.2 | | | 71 | | 0.25 | 3.1 | |
| **3810** | 2 | | | 91 | | 0.21 | 2.7 | |
| **3811** | 2.1 | | | 76 | | 0.22 | 2.2 | |
| **3812** | 1.4 | | | 80 | | 0.17 | 3.6 | |
| **3813** | 1.7 | | | 81 | | 0.2 | 3.1 | |

| **Element** | **Mg** | **Mn** | **Mo** | **Na** | **Nb** | **Ni** | **P** | **Pb** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **1** | **0.01** | **0.001** | **0.02** | **0.1** | **0.001** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** |
| **460** | 0.66 | 97 | 4.92 | 0.195 | | 40.9 | 0.067 | 16.35 |
| **461** | 0.63 | 102 | 4.49 | 0.2 | | 37.8 | 0.07 | 15.38 |
| **462** | 0.51 | 86 | 19.45 | 0.172 | | 63.3 | 0.071 | 16.06 |
| **463** | 0.47 | 84 | 16.22 | 0.194 | | 53.9 | 0.071 | 17.09 |
| **464** | 0.46 | 104 | 17.37 | 0.196 | | 51.1 | 0.071 | 16.18 |
| **465** | 0.58 | 102 | 16.92 | 0.178 | | 46.8 | 0.071 | 15.2 |
| **466** | 0.47 | 101 | 19.7 | 0.182 | | 50 | 0.068 | 17.02 |
| **467** | 0.42 | 74 | 10.5 | 0.19 | | 55.5 | 0.067 | 16.27 |
| **468** | 0.51 | 89 | 23.08 | 0.176 | | 57.2 | 0.082 | 16.87 |
| **470** | 0.42 | 68 | 9.2 | 0.166 | | 55 | 0.075 | 16.93 |
| **471** | 0.56 | 80 | 10.02 | 0.154 | | 49.2 | 0.078 | 15.96 |
| **472** | 0.4 | 75 | 10.78 | 0.176 | | 65.7 | 0.074 | 20.15 |
| **473** | 0.44 | 85 | 7.99 | 0.175 | | 53.6 | 0.073 | 17.87 |
| **475** | 0.56 | 108 | 16.68 | 0.172 | | 46.7 | 0.075 | 16.22 |
| **476** | 0.49 | 74 | 16.87 | 0.174 | | 67.6 | 0.068 | 17.36 |
| **477** | 0.54 | 81 | 24.36 | 0.164 | | 62.7 | 0.074 | 17.01 |
| **478** | 0.65 | 90 | 18 | 0.144 | | 43.5 | 0.145 | 13.43 |
| **479** | 0.49 | 77 | 11.15 | 0.179 | | 62.5 | 0.068 | 17.77 |
| **480** | 0.46 | 80 | 18.36 | 0.149 | | 58.2 | 0.073 | 15.37 |
| **481** | 0.48 | 71 | 15.04 | 0.16 | | 61 | 0.075 | 16.23 |
| **482** | 0.42 | 76 | 12.53 | 0.161 | | 58.5 | 0.073 | 15.56 |
| **483** | 0.71 | 91 | 10.51 | 0.138 | | 55.9 | 0.076 | 14.07 |
| **484** | 0.53 | 68 | 4 | 0.211 | | 45.4 | 0.069 | 16.58 |
| **485** | 0.56 | 90 | 3.8 | 0.209 | | 42.2 | 0.065 | 16.53 |
| **486** | 0.44 | 113 | 4.5 | 0.208 | | 33.4 | 0.047 | 19.99 |
| **487** | 0.5 | 76 | 3.48 | 0.215 | | 42 | 0.066 | 16.11 |
| **488** | 0.6 | 77 | 2.92 | 0.2 | | 37.9 | 0.068 | 15.36 |
| **489** | 0.52 | 79 | 2.44 | 0.205 | | 36.8 | 0.068 | 15.26 |
| **490** | 0.46 | 84 | 2.45 | 0.213 | | 39.1 | 0.066 | 15.84 |
| **491** | 0.52 | 89 | 4.03 | 0.197 | | 38.5 | 0.067 | 13.94 |
| **492** | 0.66 | 90 | 3.79 | 0.19 | | 41 | 0.071 | 15.52 |
| **493** | 0.59 | 81 | 3.27 | 0.183 | | 36.9 | 0.067 | 14.64 |
| **494** | 0.64 | 96 | 4.78 | 0.185 | | 36.7 | 0.069 | 14.72 |
| **496** | 0.64 | 96 | 10.32 | 0.195 | | 53.6 | 0.07 | 14.42 |
| **497** | 0.58 | 88 | 10.05 | 0.176 | | 47.9 | 0.063 | 14.23 |
| **498** | 0.95 | 87 | 16.81 | 0.05 | | 11.5 | 0.049 | 3.28 |
| **499** | 0.55 | 109 | 7.54 | 0.174 | | 48.1 | 0.074 | 15.09 |
| **500** | 0.54 | 105 | 8.8 | 0.166 | | 44.3 | 0.07 | 14.57 |
| **3807** | 0.61 | 118 | 5.82 | 0.165 | | 42.9 | 0.071 | 14.02 |
| **3808** | 0.46 | 78 | 6.28 | 0.178 | | 52.7 | 0.063 | 15.06 |
| **3809** | 0.48 | 92 | 7.38 | 0.181 | | 56.4 | 0.068 | 15.49 |
| **3810** | 0.53 | 94 | 6.46 | 0.186 | | 50.4 | 0.067 | 15.51 |
| **3811** | 0.5 | 85 | 4.17 | 0.186 | | 44.4 | 0.058 | 15.73 |
| **3812** | 0.49 | 89 | 10.28 | 0.134 | | 47.1 | 0.076 | 13.85 |
| **3813** | 0.48 | 73 | 9.93 | 0.156 | | 54 | 0.071 | 15.97 |

| **Element** | **Pd** | **Pt** | **Rb** | **Re** | **S** | **Sb** | **Sc** | **Se** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **10** | **2** | **0.1** | **1** | **0.02** | **0.02** | **0.1** | **0.1** |
| **Samples** | **ppb** | **ppb** | **ppm** | **ppb** | **%** | **ppm** | **ppm** | **ppm** |
| **460** | | | | | 2.86 | 0.92 | 4.9 | 2.2 |
| **461** | | | | | 2.59 | 0.97 | 5 | 1.9 |
| **462** | | | | | 2.81 | 1.57 | 5.8 | 3.7 |
| **463** | | | | | 2.69 | 1.27 | 4.8 | 3.2 |
| **464** | | | | | 2.89 | 1.04 | 5.7 | 3.1 |
| **465** | | | | | 2.65 | 0.88 | 5.8 | 2.8 |
| **466** | | | | | 2.85 | 1.13 | 5.3 | 3.2 |
| **467** | | | | | 2.27 | 1.45 | 4.4 | 3 |
| **468** | | | | | 3.21 | 1.16 | 4.1 | 4.4 |
| **470** | | | | | 2.98 | 1.09 | 4.8 | 2.9 |
| **471** | | | | | 3.3 | 0.99 | 5.2 | 3 |
| **472** | | | | | 3.1 | 1.39 | 5.6 | 3.6 |
| **473** | | | | | 3.18 | 1.15 | 5.3 | 3.2 |
| **475** | | | | | 3.16 | 1.11 | 4.9 | 3.5 |
| **476** | | | | | 3.31 | 1.64 | 4.9 | 3.9 |
| **477** | | | | | 3.12 | 1.65 | 4.9 | 4.3 |
| **478** | | | | | 3.08 | 1.27 | 6.7 | 3.3 |
| **479** | | | | | 2.66 | 1.65 | 4.1 | 4.2 |
| **480** | | | | | 3.05 | 1.99 | 4.3 | 4 |
| **481** | | | | | 3.17 | 1.91 | 4.2 | 4.1 |
| **482** | | | | | 3.02 | 1.53 | 4.9 | 3.7 |
| **483** | | | | | 3.27 | 1.55 | 5.6 | 3.4 |
| **484** | | | | | 2.21 | 0.69 | 4.9 | 1.6 |
| **485** | | | | | 2.11 | 0.61 | 5 | 1.4 |
| **486** | | | | | 3.74 | 0.58 | 4.2 | 1.7 |
| **487** | | | | | 2.18 | 0.65 | 4.9 | 1.5 |
| **488** | | | | | 2.52 | 0.66 | 5 | 1.5 |
| **489** | | | | | 2.46 | 0.58 | 5 | 1.4 |
| **490** | | | | | 2.63 | 0.6 | 4.9 | 1.5 |
| **491** | | | | | 2.5 | 0.84 | 4.2 | 2 |
| **492** | | | | | 2.74 | 0.76 | 4.5 | 1.9 |
| **493** | | | | | 2.34 | 0.75 | 4.6 | 1.8 |
| **494** | | | | | 2.46 | 0.88 | 4.8 | 2.1 |
| **496** | | | | | 2.88 | 1.24 | 4.8 | 3.5 |
| **497** | | | | | 2.81 | 1.29 | 4.8 | 3.5 |
| **498** | | | | | 4.44 | 0.8 | 2.9 | 2.1 |
| **499** | | | | | 3.08 | 1.25 | 5.2 | 3.5 |
| **500** | | | | | 3.17 | 1.18 | 5 | 3.5 |
| **3807** | | | | | 2.82 | 1 | 4.5 | 3.2 |
| **3808** | | | | | 2.76 | 0.93 | 4.4 | 3.1 |
| **3809** | | | | | 3.12 | 0.92 | 5.5 | 3.5 |
| **3810** | | | | | 3.03 | 1.04 | 4.9 | 3.5 |
| **3811** | | | | | 2.54 | 0.72 | 4.8 | 2.3 |
| **3812** | | | | | 2.64 | 1.19 | 5.7 | 2.8 |
| **3813** | | | | | 2.68 | 1.28 | 4.8 | 2.8 |

| **Element** | **Sn** | **Sr** | **Ta** | **Te** | **Th** | **Ti** | **Tl** | **U** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.5** | **0.05** | **0.02** | **0.1** | **0.001** | **0.02** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **460** | | 79.9 | | 0.14 | 4.8 | < .001 | 0.14 | 1.4 |
| **461** | | 104.3 | | 0.13 | 5 | < .001 | 0.12 | 1.55 |
| **462** | | 112.1 | | 0.13 | 4.3 | < .001 | 0.22 | 3.31 |
| **463** | | 109.6 | | 0.12 | 4.6 | < .001 | 0.19 | 2.33 |
| **464** | | 112.9 | | 0.1 | 4.5 | < .001 | 0.17 | 2.62 |
| **465** | | 128.1 | | 0.08 | 4.4 | < .001 | 0.11 | 2.87 |
| **466** | | 103.8 | | 0.11 | 4.9 | < .001 | 0.16 | 3.09 |
| **467** | | 82.6 | | 0.1 | 4.5 | < .001 | 0.26 | 1.72 |
| **468** | | 122.5 | | 0.13 | 4.6 | < .001 | 0.11 | 3.8 |
| **470** | | 105.1 | | 0.13 | 4.7 | < .001 | 0.21 | 2.32 |
| **471** | | 113.2 | | 0.11 | 4.6 | < .001 | 0.24 | 2.26 |
| **472** | | 89.1 | | 0.15 | 4.8 | < .001 | 0.26 | 2.46 |
| **473** | | 104.7 | | 0.14 | 4.4 | < .001 | 0.15 | 2.41 |
| **475** | | 125.4 | | 0.1 | 4.3 | < .001 | 0.1 | 4.02 |
| **476** | | 86.7 | | 0.15 | 4.2 | < .001 | 0.3 | 2.28 |
| **477** | | 126.1 | | 0.1 | 4.5 | < .001 | 0.24 | 3.7 |
| **478** | | 190.8 | | 0.1 | 4.4 | < .001 | 0.13 | 8.62 |
| **479** | | 83.1 | | 0.12 | 4.5 | < .001 | 0.34 | 1.6 |
| **480** | | 154.5 | | 0.14 | 4.6 | < .001 | 0.21 | 3.76 |
| **481** | | 138.2 | | 0.14 | 5 | < .001 | 0.23 | 2.93 |
| **482** | | 144.9 | | 0.12 | 4.5 | < .001 | 0.2 | 2.72 |
| **483** | | 123.8 | | 0.11 | 4.1 | < .001 | 0.28 | 2.31 |
| **484** | | 67 | | 0.11 | 4.6 | < .001 | 0.15 | 0.88 |
| **485** | | 72.4 | | 0.09 | 5.2 | < .001 | 0.15 | 1.02 |
| **486** | | 58.1 | | 0.07 | 6.6 | < .001 | 0.26 | 0.64 |
| **487** | | 64.6 | | 0.11 | 4.4 | 0.004 | 0.16 | 0.85 |
| **488** | | 68 | | 0.08 | 4.3 | 0.003 | 0.11 | 0.95 |
| **489** | | 70 | | 0.1 | 4.7 | < .001 | 0.09 | 1.09 |
| **490** | | 78 | | 0.08 | 4.6 | 0.002 | 0.09 | 0.92 |
| **491** | | 70.1 | | 0.1 | 4.2 | < .001 | 0.11 | 1.44 |
| **492** | | 67.9 | | 0.11 | 4.7 | < .001 | 0.1 | 1.36 |
| **493** | | 65.3 | | 0.09 | 4.5 | < .001 | 0.07 | 1.29 |
| **494** | | 77.8 | | 0.1 | 4.6 | < .001 | 0.08 | 1.76 |
| **496** | | 83.7 | | 0.11 | 4.2 | < .001 | 0.17 | 2.17 |
| **497** | | 77.2 | | 0.15 | 4 | 0.003 | 0.12 | 2.01 |
| **498** | | 262.4 | | 0.03 | 1 | < .001 | 0.07 | 1.15 |
| **499** | | 75.4 | | 0.18 | 4.3 | 0.008 | 0.1 | 2.65 |
| **500** | | 114.2 | | 0.1 | 4.1 | < .001 | 0.09 | 2.6 |
| **3807** | | 112.4 | | 0.12 | 4.1 | 0.005 | 0.08 | 2.23 |
| **3808** | | 84.6 | | 0.14 | 4.1 | 0.006 | 0.12 | 1.58 |
| **3809** | | 89.7 | | 0.12 | 4.1 | < .001 | 0.1 | 2.24 |
| **3810** | | 85.1 | | 0.13 | 4.3 | 0.005 | 0.11 | 1.75 |
| **3811** | | 62.9 | | 0.08 | 4.1 | < .001 | 0.13 | 1.12 |
| **3812** | | 165 | | 0.1 | 3.8 | < .001 | 0.17 | 2.59 |
| **3813** | | 109.7 | | 0.12 | 4.5 | < .001 | 0.18 | 1.74 |

***Analysis: GROUP 1EX - 0.25 GM***

| **Element** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ag** | **Al** | **As** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.1** | **0.01** | **0.1** | **0.1** | **0.1** | **0.01** | **1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** |
| **460** | 21 | <.1 | | 122.7 | | | | |
| **461** | 21 | <.1 | | 216.9 | | | | |
| **462** | 39 | <.1 | | 170.9 | | | | |
| **463** | 32 | <.1 | | 172 | | | | |
| **464** | 30 | <.1 | | 186.9 | | | | |
| **465** | 41 | <.1 | | 204.8 | | | | |
| **466** | 28 | <.1 | | 153 | | | | |
| **467** | 42 | <.1 | | 144.1 | | | | |
| **468** | 33 | <.1 | | 154.3 | | | | |
| **470** | 33 | <.1 | | 139.8 | | | | |
| **471** | 34 | <.1 | | 197.7 | | | | |
| **472** | 35 | <.1 | | 207.2 | | | | |
| **473** | 29 | <.1 | | 183.7 | | | | |
| **475** | 28 | <.1 | | 182.5 | | | | |
| **476** | 39 | <.1 | | 168.3 | | | | |
| **477** | 39 | <.1 | | 198.1 | | | | |
| **478** | 37 | <.1 | | 181.1 | | | | |
| **479** | 42 | <.1 | | 157.1 | | | | |
| **480** | 41 | <.1 | | 136.1 | | | | |
| **481** | 38 | <.1 | | 135.3 | | | | |
| **482** | 42 | <.1 | | 133.2 | | | | |
| **483** | 44 | <.1 | | 165.2 | | | | |
| **484** | 27 | <.1 | | 113.5 | | | | |
| **485** | 26 | <.1 | | 207.6 | | | | |
| **486** | 26 | <.1 | | 105 | | | | |
| **487** | 29 | <.1 | | 121.6 | | | | |
| **488** | 24 | <.1 | | 122.5 | | | | |
| **489** | 24 | <.1 | | 112.8 | | | | |
| **490** | 27 | <.1 | | 123.6 | | | | |
| **491** | 23 | <.1 | | 116.1 | | | | |
| **492** | 25 | <.1 | | 133 | | | | |
| **493** | 23 | <.1 | | 188.7 | | | | |
| **494** | 22 | <.1 | | 163.8 | | | | |
| **496** | 31 | <.1 | | 158.6 | | | | |
| **497** | 28 | <.1 | | 143.4 | | | | |
| **498** | 18 | <.1 | | 61.8 | | | | |
| **499** | 26 | <.1 | | 185 | | | | |
| **500** | 25 | <.1 | | 143.2 | | | | |
| **3807** | 23 | <.1 | | 141.4 | | | | |
| **3808** | 24 | <.1 | | 163.7 | | | | |
| **3809** | 28 | <.1 | | 137.5 | | | | |
| **3810** | 27 | <.1 | | 205.2 | | | | |
| **3811** | 23 | <.1 | | 130.9 | | | | |
| **3812** | 31 | <.1 | | 147.5 | | | | |
| **3813** | 38 | <.1 | | 134.1 | | | | |

| **Samples** | **Hole** | **Latitude** | **Longitude** | **From (m)** | **To (m)** | **Analysis Date** |
|---|---|---|---|---|---|---|
| **3814** | 02/16-27-058-20W5/0 | 54.049053 | -116.877692 | 1827.410 | 1827.485 | Dec. 2003 |
| **3815** | 02/16-27-058-20W5/0 | 54.049053 | -116.877692 | 1828.510 | 1828.575 | Dec. 2003 |
| **3817** | 02/16-27-058-20W5/0 | 54.049053 | -116.877692 | 1829.500 | 1829.550 | Dec. 2003 |
| **3818** | 02/16-27-058-20W5/0 | 54.049053 | -116.877692 | 1830.490 | 1830.450 | Dec. 2003 |
| **3819** | 02/16-27-058-20W5/0 | 54.049053 | -116.877692 | 1831.450 | 1831.500 | Dec. 2003 |
| **3820** | 02/16-27-058-20W5/0 | 54.049053 | -116.877692 | 1832.330 | 1832.380 | Dec. 2003 |
| **3821** | 02/16-27-058-20W5/0 | 54.049053 | -116.877692 | 1832.710 | 1832.730 | Dec. 2003 |
| **3822** | 02/16-27-058-20W5/0 | 54.049053 | -116.877692 | 1833.440 | 1833.490 | Dec. 2003 |
| **3823** | 02/16-27-058-20W5/0 | 54.049053 | -116.877692 | 1834.350 | 1834.490 | Dec. 2003 |
| **3824** | 02/16-27-058-20W5/0 | 54.049053 | -116.877692 | 1835.440 | 1835.490 | Dec. 2003 |
| **3825** | 02/16-27-058-20W5/0 | 54.049053 | -116.877692 | 1836.410 | 1836.460 | Dec. 2003 |
| **3826** | 02/16-27-058-20W5/0 | 54.049053 | -116.877692 | 1836.270 | 1836.320 | Dec. 2003 |
| **3827** | 00/10-28-059-20W5/0 | 54.133561 | -116.932429 | 1876.820 | 1876.870 | Dec. 2003 |
| **3830** | 00/10-28-059-20W5/0 | 54.133561 | -116.932429 | 1877.410 | 1877.480 | Dec. 2003 |
| **3831** | 00/10-28-059-20W5/0 | 54.133561 | -116.932429 | 1878.350 | 1878.420 | Dec. 2003 |
| **3832** | 00/10-28-059-20W5/0 | 54.133561 | -116.932429 | 1879.390 | 1879.455 | Dec. 2003 |
| **3833** | 00/10-28-059-20W5/0 | 54.133561 | -116.932429 | 1880.370 | 1880.440 | Dec. 2003 |
| **3834** | 00/10-28-059-20W5/0 | 54.133561 | -116.932429 | 1881.380 | 1881.455 | Dec. 2003 |
| **3835** | 00/10-28-059-20W5/0 | 54.133561 | -116.932429 | 1882.420 | 1882.420 | Dec. 2003 |
| **3836** | 00/10-28-059-20W5/0 | 54.133561 | -116.932429 | 1883.450 | 1883.520 | Dec. 2003 |
| **3837** | 00/10-28-059-20W5/0 | 54.133561 | -116.932429 | 1884.450 | 1884.490 | Dec. 2003 |
| **3838** | 00/10-28-059-20W5/0 | 54.133561 | -116.932429 | 1885.430 | 1885.500 | Dec. 2003 |
| **3839** | 00/10-28-059-20W5/0 | 54.133561 | -116.932429 | 1886.440 | 1886.510 | Dec. 2003 |
| **3840** | 00/10-28-059-20W5/0 | 54.133561 | -116.932429 | 1873.410 | 1873.475 | Dec. 2003 |
| **3841** | 00/10-28-059-20W5/0 | 54.133561 | -116.932429 | 1880.435 | 1880.500 | Dec. 2003 |
| **3845** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1272.710 | 1272.785 | Dec. 2003 |
| **3846** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1273.710 | 1273.780 | Dec. 2003 |
| **3847** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1274.710 | 1274.780 | Dec. 2003 |
| **3848** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1275.650 | 1275.700 | Dec. 2003 |
| **3849** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1275.700 | 1275.770 | Dec. 2003 |
| **3850** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1276.715 | 1276.780 | Dec. 2003 |
| **3851** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1277.710 | 1277.770 | Dec. 2003 |
| **3852** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1278.690 | 1278.760 | Dec. 2003 |
| **3853** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1279.670 | 1979.740 | Dec. 2003 |
| **3854** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1279.990 | 1280.020 | Dec. 2003 |
| **3855** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1280.670 | 1280.725 | Dec. 2003 |
| **3856** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1281.705 | 1281.766 | Dec. 2003 |
| **3859** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1282.640 | 1282.700 | Dec. 2003 |
| **3861** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1283.550 | 1283.620 | Dec. 2003 |
| **3862** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1284.690 | 1284.740 | Dec. 2003 |
| **3863** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1285.715 | 1285.785 | Dec. 2003 |
| **3864** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1286.630 | 1286.710 | Dec. 2003 |
| **3865** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1287.610 | 1287.670 | Dec. 2003 |
| **3866** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1288.540 | 1288.600 | Dec. 2003 |
| **3867** | 00/10-09-066-23W5/0 | 54.700355 | -117.410259 | 1289.555 | 1289.615 | Dec. 2003 |
| **3869** | 02/06-30-064-01W6/0 | 54.565516 | -118.138962 | 1555.500 | 1555.550 | Dec. 2003 |
| **3871** | 02/06-30-064-01W6/0 | 54.565516 | -118.138962 | 1556.410 | 1556.460 | Dec. 2003 |
| **3873** | 02/06-30-064-01W6/0 | 54.565516 | -118.138962 | 1557.390 | 1557.450 | Dec. 2003 |

| Samples | Probability of Fm | Formation | Sample Description |
|---|---|---|---|
| 3814 | Possible | Second White Specks | Dk grey shale, some silt, micas |
| 3815 | Possible | Second White Specks | Dk grey shale, some micas |
| 3817 | Possible | Second White Specks | Broken fragments of shale, some micas and silt |
| 3818 | Possible | Second White Specks | Broken fragments of shale, shelly fragments, micas, some silt |
| 3819 | Possible | Second White Specks | Broken fragments of shale, some silt, micas, some organic fragments |
| 3820 | Possible | Second White Specks | Broken fragments of shale, some silt |
| 3821 | Possible | Second White Specks | Sandy/silty lam full of pyrite - bentonite? |
| 3822 | Possible | Second White Specks | Broken fragments of dk grey shale, some silt |
| 3823 | Possible | Second White Specks | Broken fragments of dk grey shale, some silt |
| 3824 | Possible | Second White Specks | Broken fragments of dk grey shale, some silt |
| 3825 | Possible | Second White Specks | Broken fragments of dk grey shale, some silt, some black organic debris |
| 3826 | Possible | Second White Specks | Broken fragments of dk grey shale, some silt |
| 3827 | Possible | Second White Specks | Red/brown specks, dk grey shale with silty lams |
| 3830 | Possible | Second White Specks | Dk grey shale with some lams, shelly debris |
| 3831 | Possible | Second White Specks | Dk grey shale, some silty lams |
| 3832 | Possible | Second White Specks | Dk grey shale, some silt |
| 3833 | Possible | Second White Specks | Dk grey shale, some silt, very smooth |
| 3834 | Possible | Second White Specks | Dk grey shale, some shelly fragments, some micas |
| 3835 | Possible | Second White Specks | Broken fragments of shale, some silt, shelly fragments |
| 3836 | Possible | Second White Specks | Dk grey shale, broken fragments, some silt |
| 3837 | Possible | Second White Specks | Broken fragments of shale, some silt |
| 3838 | Possible | Second White Specks | Dk grey shale, some silty pockets |
| 3839 | Possible | Second White Specks | Dk grey shale, some silt, some black organic fragments |
| 3840 | Possible | Second White Specks | Dk grey shale, some silt |
| 3841 | Possible | Second White Specks | Dk grey shale, some silt, some black organic fragments |
| 3845 | Unknown | Belle Fourche (or underlying unit) | Sand - calcareous (may be good for micropaleo), white and black coloured grains |
| 3846 | Unknown | Belle Fourche (or underlying unit) | Bioturbated sand/shale, micas |
| 3847 | Unknown | Belle Fourche (or underlying unit) | Bioturbated sand/shale |
| 3848 | Unknown | Belle Fourche (or underlying unit) | Broken fragments of dk grey shale, some silt |
| 3849 | Unknown | Belle Fourche (or underlying unit) | Siderite? Med brown coloured |
| 3850 | Unknown | Belle Fourche (or underlying unit) | Broken fragments of shale, mica rich, pockets of silt |
| 3851 | Unknown | Belle Fourche (or underlying unit) | Broken fragments of dk grey shale, micas, some silt |
| 3852 | Unknown | Belle Fourche (or underlying unit) | Broken fragments of dk grey shale, micas, some silt |
| 3853 | Unknown | Belle Fourche (or underlying unit) | Broken fragments of dk grey shale, smooth, some silt |
| 3854 | Unknown | Belle Fourche (or underlying unit) | Siderite? |
| 3855 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale with sandy lams, some silt |
| 3856 | Unknown | Belle Fourche (or underlying unit) | Broken fragments of dk grey shale, micas, some silt |
| 3859 | Unknown | Belle Fourche (or underlying unit) | Broken fragments of shale |
| 3861 | Unknown | Belle Fourche (or underlying unit) | Calcareous sand, some muddy lams, some red coloured grains, micas |
| 3862 | Unknown | Belle Fourche (or underlying unit) | Broken fragments of shale, micas, some silt |
| 3863 | Unknown | Belle Fourche (or underlying unit) | Sand/shale/siderite, micas |
| 3864 | Unknown | Belle Fourche (or underlying unit) | Sand/shale/siderite, some silty pockets |
| 3865 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, some silt, some fish fragments |
| 3866 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale with some sand lams |
| 3867 | Unknown | Belle Fourche (or underlying unit) | Sandy dk grey shale, micas |
| 3869 | Possible/Unknown | Belle Fourche | Dk grey shale with calcareous lams, some silty pockets |
| 3871 | Possible/Unknown | Belle Fourche | Broken fragments of shale, silty pockets |
| 3873 | Possible/Unknown | Belle Fourche | Broken fragments of shale, micas, pockets of silt |

***Analysis: GROUP 1F1 - 1.00 GM***

| **Element** | **Ag** | **Al** | **As** | **Au** | **B** | **Ba** | **Be** | **Bi** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** | **0.1** | **0.02** |
| **Samples** | **ppb** | **%** | **ppm** | **ppb** | **ppm** | **ppm** | **ppm** | **ppm** |
| **3814** | 288 | 0.63 | 28.8 | 0.2 | 7 | 46.2 |  | 0.28 |
| **3815** | 322 | 0.68 | 31.2 | 0.2 | 9 | 44.7 |  | 0.3 |
| **3817** | 222 | 0.71 | 24.2 | 0.3 | 8 | 60.7 |  | 0.22 |
| **3818** | 226 | 0.78 | 23.8 | 0.4 | 7 | 51.8 |  | 0.24 |
| **3819** | 210 | 0.78 | 25.4 | 0.3 | 6 | 54.3 |  | 0.27 |
| **3820** | 211 | 0.79 | 25 | < .2 | 7 | 57.5 |  | 0.27 |
| **3821** | 210 | 0.91 | 26.6 | 0.5 | 8 | 39.7 |  | 0.31 |
| **3822** | 207 | 0.86 | 23 | < .2 | 6 | 52.5 |  | 0.26 |
| **3823** | 170 | 0.85 | 22 | < .2 | 6 | 55.3 |  | 0.26 |
| **3824** | 185 | 0.85 | 21.2 | 0.4 | 7 | 60.4 |  | 0.29 |
| **3825** | 192 | 0.79 | 18.5 | < .2 | 8 | 63.1 |  | 0.27 |
| **3826** | 170 | 0.77 | 17 | < .2 | 8 | 55.8 |  | 0.24 |
| **3827** | 273 | 0.48 | 29.8 | 1.1 | 6 | 64.4 |  | 0.23 |
| **3830** | 263 | 0.58 | 32.9 | 0.6 | 9 | 52.7 |  | 0.28 |
| **3831** | 291 | 0.61 | 31.9 | 0.3 | 7 | 51.5 |  | 0.29 |
| **3832** | 251 | 0.59 | 30.5 | 0.4 | 8 | 48.7 |  | 0.26 |
| **3833** | 318 | 0.63 | 31.8 | 0.9 | 7 | 45.6 |  | 0.29 |
| **3834** | 296 | 0.68 | 30.5 | 0.5 | 7 | 50.8 |  | 0.27 |
| **3835** | 243 | 0.71 | 22.8 | 0.7 | 7 | 70.3 |  | 0.22 |
| **3836** | 223 | 0.74 | 23.3 | 0.6 | 7 | 72.7 |  | 0.24 |
| **3837** | 238 | 0.78 | 26.3 | 1.1 | 8 | 68.4 |  | 0.24 |
| **3838** | 232 | 0.8 | 24.4 | 0.4 | 8 | 78.5 |  | 0.24 |
| **3839** | 200 | 0.82 | 25.7 | 0.6 | 7 | 68.8 |  | 0.25 |
| **3840** | 213 | 0.82 | 23.4 | 0.5 | 10 | 74.2 |  | 0.26 |
| **3841** | 209 | 0.81 | 22.4 | 0.6 | 7 | 60.1 |  | 0.24 |
| **3845** | 81 | 0.28 | 55 | 0.5 | 3 | 156.5 |  | 0.04 |
| **3846** | 220 | 0.86 | 12.1 | 0.5 | 7 | 210.1 |  | 0.15 |
| **3847** | 270 | 0.92 | 14.6 | 0.6 | 7 | 185.1 |  | 0.2 |
| **3848** | 390 | 1.27 | 7.6 | 1.3 | 10 | 443.3 |  | 0.33 |
| **3849** | 271 | 0.95 | 8.8 | 1.4 | 11 | 442.1 |  | 0.21 |
| **3850** | 403 | 1.33 | 2 | 1.9 | 12 | 413.6 |  | 0.34 |
| **3851** | 367 | 1.31 | 1.5 | 1 | 11 | 452 |  | 0.32 |
| **3852** | 360 | 1.33 | 4.8 | 1.9 | 11 | 427.6 |  | 0.32 |
| **3853** | 360 | 1.4 | 19 | 1.4 | 12 | 517.7 |  | 0.39 |
| **3854** | 221 | 1.03 | 12.3 | 0.4 | 13 | 642.9 |  | 0.24 |
| **3855** | 309 | 1.21 | 29.2 | 1.8 | 10 | 265.8 |  | 0.3 |
| **3856** | 315 | 1.4 | 20.5 | 0.6 | 10 | 475.2 |  | 0.4 |
| **3859** | 358 | 1.47 | 15.4 | 1.6 | 13 | 490 |  | 0.39 |
| **3861** | 60 | 0.35 | 8.1 | 0.4 | 3 | 196.8 |  | 0.03 |
| **3862** | 399 | 1.4 | 5.7 | 1.6 | 11 | 431.4 |  | 0.38 |
| **3863** | 253 | 0.9 | 8.9 | 0.8 | 9 | 297.1 |  | 0.17 |
| **3864** | 307 | 1.15 | 3.4 | 1.3 | 10 | 338.6 |  | 0.22 |
| **3865** | 400 | 1.35 | 2.4 | 1.1 | 11 | 442.7 |  | 0.32 |
| **3866** | 280 | 1.08 | 7 | 1 | 8 | 289.6 |  | 0.2 |
| **3867** | 324 | 1.25 | 2.7 | 1.1 | 9 | 368.5 |  | 0.26 |
| **3869** | 184 | 0.98 | 12.9 | 0.7 | 10 | 67.1 |  | 0.34 |
| **3871** | 204 | 1.15 | 15.1 | 0.4 | 12 | 64 |  | 0.33 |
| **3873** | 214 | 0.96 | 13.8 | 0.4 | 12 | 64.1 |  | 0.33 |

| **Element** | **Ca** | **Cd** | **Ce** | **Co** | **Cr** | **Cs** | **Cu** | **Fe** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **0.01** | **0.1** | **0.1** | **0.5** | **0.02** | **0.01** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **3814** | 3.21 | 1.15 |  | 14.8 | 11.7 |  | 35.01 | 3 |
| **3815** | 2.96 | 1.35 |  | 17.5 | 12.6 |  | 37.95 | 3.39 |
| **3817** | 2.6 | 0.77 |  | 13.6 | 12.7 |  | 29.72 | 2.73 |
| **3818** | 1.68 | 0.53 |  | 13.7 | 12.5 |  | 31.43 | 2.92 |
| **3819** | 1.87 | 0.67 |  | 13.6 | 14.1 |  | 32.36 | 3.01 |
| **3820** | 1.94 | 0.67 |  | 13.6 | 14.1 |  | 32.09 | 2.99 |
| **3821** | 1.5 | 0.4 |  | 12.6 | 11.5 |  | 37.2 | 3.45 |
| **3822** | 1.86 | 0.46 |  | 13.4 | 14.7 |  | 30.97 | 3.1 |
| **3823** | 1.7 | 0.66 |  | 13.2 | 15 |  | 29.5 | 2.94 |
| **3824** | 1.96 | 0.42 |  | 13.4 | 15.1 |  | 31.16 | 3.08 |
| **3825** | 1.79 | 0.4 |  | 13.1 | 14.5 |  | 29.8 | 3.07 |
| **3826** | 2.21 | 0.31 |  | 11.7 | 13.7 |  | 27.18 | 3.26 |
| **3827** | 6.12 | 0.95 |  | 12.8 | 10.2 |  | 31.02 | 2.9 |
| **3830** | 3.96 | 0.95 |  | 14.7 | 10.7 |  | 34.21 | 2.98 |
| **3831** | 3.73 | 1.07 |  | 15.2 | 12.1 |  | 35.28 | 3.05 |
| **3832** | 3.42 | 1.01 |  | 13.7 | 11.3 |  | 32.3 | 3.18 |
| **3833** | 3.58 | 1.4 |  | 16.2 | 12 |  | 38.37 | 3.32 |
| **3834** | 3.46 | 1.26 |  | 15.8 | 12.1 |  | 35.77 | 3.26 |
| **3835** | 2.41 | 0.97 |  | 13.7 | 12 |  | 31.85 | 2.57 |
| **3836** | 1.8 | 0.65 |  | 13.4 | 12 |  | 30.31 | 2.66 |
| **3837** | 1.9 | 1.03 |  | 14.5 | 13.1 |  | 31.95 | 3.01 |
| **3838** | 1.55 | 0.65 |  | 13.8 | 13.6 |  | 32.47 | 2.83 |
| **3839** | 1.71 | 0.59 |  | 13.1 | 14.1 |  | 30.37 | 2.95 |
| **3840** | 1.99 | 0.6 |  | 13 | 13.3 |  | 32.54 | 2.89 |
| **3841** | 1.77 | 0.64 |  | 12.9 | 14 |  | 31.22 | 2.95 |
| **3845** | 4.72 | 0.09 |  | 3.8 | 7 |  | 4.79 | 1.53 |
| **3846** | 0.33 | 0.23 |  | 11.5 | 22.3 |  | 19.64 | 2.83 |
| **3847** | 0.28 | 0.26 |  | 12.4 | 24.7 |  | 25.02 | 2.67 |
| **3848** | 0.38 | 0.62 |  | 13.6 | 26 |  | 50.86 | 2.68 |
| **3849** | 1.11 | 0.4 |  | 9.7 | 20.9 |  | 29.58 | 8.06 |
| **3850** | 0.42 | 0.71 |  | 13.5 | 29.2 |  | 54.55 | 3.01 |
| **3851** | 0.44 | 0.53 |  | 15.7 | 27.8 |  | 50.14 | 3.47 |
| **3852** | 0.42 | 0.61 |  | 15.5 | 27.7 |  | 47.33 | 3.2 |
| **3853** | 0.31 | 0.49 |  | 13.2 | 28.5 |  | 52.8 | 2.83 |
| **3854** | 1.69 | 0.21 |  | 9.4 | 20.9 |  | 28.77 | 14.88 |
| **3855** | 0.41 | 0.31 |  | 15.9 | 27.3 |  | 38.37 | 3.58 |
| **3856** | 0.31 | 0.33 |  | 16.2 | 30 |  | 48.08 | 2.75 |
| **3859** | 0.31 | 0.42 |  | 16.7 | 30.3 |  | 49.54 | 2.68 |
| **3861** | 8.59 | 0.05 |  | 4.3 | 11.3 |  | 3.19 | 1.46 |
| **3862** | 0.5 | 0.56 |  | 13.5 | 33 |  | 55.5 | 3.19 |
| **3863** | 0.65 | 0.56 |  | 10.7 | 21.1 |  | 25.88 | 4.23 |
| **3864** | 0.54 | 0.49 |  | 12.7 | 25.4 |  | 33.78 | 3.32 |
| **3865** | 0.41 | 0.62 |  | 14.1 | 29.5 |  | 48.59 | 3.18 |
| **3866** | 0.48 | 0.4 |  | 13.3 | 23.9 |  | 29.92 | 2.99 |
| **3867** | 0.57 | 0.52 |  | 13.6 | 26.8 |  | 37.2 | 3.73 |
| **3869** | 0.39 | 0.15 |  | 10.8 | 16.6 |  | 34.06 | 2.83 |
| **3871** | 0.52 | 0.21 |  | 12.3 | 18.6 |  | 35.06 | 2.99 |
| **3873** | 0.43 | 0.23 |  | 11.7 | 16.1 |  | 33.11 | 2.85 |

| **Element** | **Ga** | **Ge** | **Hf** | **Hg** | **In** | **K** | **La** | **Li** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **0.02** | **5** | **0.02** | **0.01** | **0.5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppb** | **ppm** | **%** | **ppm** | **ppm** |
| **3814** | 1.8 | | | 71 | | 0.2 | 3 | |
| **3815** | 1.9 | | | 74 | | 0.22 | 2.9 | |
| **3817** | 2 | | | 56 | | 0.21 | 2.7 | |
| **3818** | 2.2 | | | 71 | | 0.21 | 2.7 | |
| **3819** | 2.2 | | | 73 | | 0.22 | 2.7 | |
| **3820** | 2.2 | | | 77 | | 0.22 | 2.9 | |
| **3821** | 2.2 | | | 62 | | 0.21 | 2.7 | |
| **3822** | 2.4 | | | 75 | | 0.24 | 2.9 | |
| **3823** | 2.4 | | | 60 | | 0.23 | 2.4 | |
| **3824** | 2.4 | | | 66 | | 0.23 | 2.6 | |
| **3825** | 2.3 | | | 80 | | 0.22 | 2.6 | |
| **3826** | 2.2 | | | 74 | | 0.22 | 2.6 | |
| **3827** | 1.5 | | | 84 | | 0.19 | 4 | |
| **3830** | 1.7 | | | 61 | | 0.21 | 3.4 | |
| **3831** | 1.9 | | | 70 | | 0.22 | 3.4 | |
| **3832** | 1.7 | | | 107 | | 0.2 | 3.1 | |
| **3833** | 1.8 | | | 67 | | 0.2 | 3 | |
| **3834** | 2 | | | 70 | | 0.21 | 3.2 | |
| **3835** | 2 | | | 69 | | 0.22 | 2.9 | |
| **3836** | 2 | | | 78 | | 0.22 | 2.8 | |
| **3837** | 2.2 | | | 77 | | 0.23 | 2.9 | |
| **3838** | 2.4 | | | 63 | | 0.23 | 2.9 | |
| **3839** | 2.3 | | | 84 | | 0.23 | 2.7 | |
| **3840** | 2.4 | | | 53 | | 0.22 | 3.1 | |
| **3841** | 2.3 | | | 72 | | 0.23 | 2.9 | |
| **3845** | 1.3 | | | 291 | | 0.07 | 8 | |
| **3846** | 4 | | | 214 | | 0.19 | 8 | |
| **3847** | 4.2 | | | 182 | | 0.21 | 8.3 | |
| **3848** | 4.9 | | | 106 | | 0.26 | 10.7 | |
| **3849** | 3.6 | | | 90 | | 0.21 | 11.2 | |
| **3850** | 5.4 | | | 154 | | 0.27 | 11.5 | |
| **3851** | 5.2 | | | 90 | | 0.26 | 11.2 | |
| **3852** | 5.1 | | | 158 | | 0.27 | 11.3 | |
| **3853** | 5.2 | | | 189 | | 0.29 | 12.4 | |
| **3854** | 3.5 | | | 210 | | 0.23 | 10.4 | |
| **3855** | 4.6 | | | 260 | | 0.23 | 10.3 | |
| **3856** | 5.3 | | | 155 | | 0.29 | 11.6 | |
| **3859** | 5.7 | | | 106 | | 0.3 | 12.7 | |
| **3861** | 2 | | | 79 | | 0.09 | 14.4 | |
| **3862** | 5.9 | | | 100 | | 0.27 | 12.6 | |
| **3863** | 3.5 | | | 102 | | 0.18 | 10.1 | |
| **3864** | 4.6 | | | 124 | | 0.23 | 11.1 | |
| **3865** | 5.4 | | | 105 | | 0.25 | 11.9 | |
| **3866** | 4.1 | | | 115 | | 0.21 | 10 | |
| **3867** | 4.7 | | | 120 | | 0.23 | 11.4 | |
| **3869** | 3.3 | | | 101 | | 0.24 | 3.7 | |
| **3871** | 3.5 | | | 114 | | 0.3 | 4.4 | |
| **3873** | 3 | | | 96 | | 0.26 | 4.7 | |

| **Element** | **Mg** | **Mn** | **Mo** | **Na** | **Nb** | **Ni** | **P** | **Pb** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **1** | **0.01** | **0.001** | **0.02** | **0.1** | **0.001** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** |
| **3814** | 0.55 | 79 | 6.43 | 0.165 | | 55.2 | 0.076 | 16.45 |
| **3815** | 0.5 | 75 | 6.07 | 0.172 | | 57.7 | 0.076 | 17.69 |
| **3817** | 0.57 | 79 | 7.87 | 0.183 | | 46.5 | 0.07 | 14.05 |
| **3818** | 0.49 | 102 | 6.15 | 0.194 | | 42.5 | 0.073 | 14.94 |
| **3819** | 0.54 | 80 | 5.45 | 0.192 | | 47.7 | 0.069 | 15.22 |
| **3820** | 0.55 | 93 | 5.21 | 0.195 | | 43.8 | 0.074 | 15.76 |
| **3821** | 0.45 | 149 | 5.07 | 0.214 | | 32.8 | 0.067 | 18.1 |
| **3822** | 0.55 | 100 | 3.44 | 0.202 | | 42.2 | 0.074 | 16.2 |
| **3823** | 0.5 | 89 | 4.55 | 0.204 | | 48.6 | 0.066 | 15.68 |
| **3824** | 0.6 | 102 | 3.3 | 0.201 | | 44.4 | 0.071 | 16.31 |
| **3825** | 0.56 | 93 | 2.41 | 0.189 | | 41.3 | 0.067 | 15.51 |
| **3826** | 0.72 | 127 | 2.19 | 0.186 | | 35.4 | 0.068 | 15.51 |
| **3827** | 0.57 | 89 | 9.68 | 0.145 | | 47.5 | 0.072 | 14.37 |
| **3830** | 0.47 | 75 | 10.02 | 0.174 | | 52.7 | 0.076 | 16.28 |
| **3831** | 0.45 | 68 | 9.97 | 0.183 | | 60.9 | 0.074 | 16.88 |
| **3832** | 0.5 | 65 | 7.92 | 0.173 | | 52.8 | 0.074 | 15.85 |
| **3833** | 0.52 | 74 | 7.9 | 0.184 | | 62.7 | 0.074 | 18.69 |
| **3834** | 0.55 | 70 | 5.3 | 0.174 | | 52.5 | 0.075 | 17.73 |
| **3835** | 0.49 | 71 | 9.29 | 0.192 | | 50.1 | 0.066 | 14.25 |
| **3836** | 0.5 | 70 | 8.61 | 0.195 | | 45.2 | 0.069 | 14.22 |
| **3837** | 0.55 | 89 | 7.56 | 0.201 | | 48.7 | 0.069 | 15.33 |
| **3838** | 0.48 | 83 | 6.53 | 0.215 | | 47.6 | 0.071 | 15.23 |
| **3839** | 0.52 | 71 | 5.96 | 0.2 | | 47.8 | 0.063 | 18.64 |
| **3840** | 0.56 | 87 | 5.56 | 0.201 | | 41.8 | 0.067 | 15.88 |
| **3841** | 0.5 | 81 | 3.64 | 0.205 | | 39.4 | 0.068 | 15.39 |
| **3845** | 0.12 | 192 | 1.72 | 0.051 | | 9.5 | 0.049 | 6.25 |
| **3846** | 0.44 | 210 | 0.29 | 0.155 | | 32.9 | 0.085 | 10.47 |
| **3847** | 0.43 | 197 | 0.42 | 0.191 | | 36.6 | 0.082 | 12.11 |
| **3848** | 0.56 | 490 | 1.49 | 0.275 | | 48.6 | 0.103 | 18.48 |
| **3849** | 1.08 | 1576 | 1.33 | 0.201 | | 30.7 | 0.145 | 11.49 |
| **3850** | 0.65 | 764 | 1.45 | 0.264 | | 50.1 | 0.093 | 17.69 |
| **3851** | 0.63 | 617 | 1.87 | 0.261 | | 54.7 | 0.089 | 20.13 |
| **3852** | 0.61 | 503 | 1.73 | 0.259 | | 52.9 | 0.1 | 18.38 |
| **3853** | 0.53 | 515 | 1.38 | 0.305 | | 45 | 0.091 | 18.9 |
| **3854** | 1.18 | 2884 | 0.93 | 0.219 | | 30.6 | 0.203 | 15.42 |
| **3855** | 0.54 | 473 | 3.77 | 0.206 | | 48.4 | 0.09 | 17.49 |
| **3856** | 0.55 | 393 | 1.17 | 0.285 | | 47.9 | 0.093 | 20.68 |
| **3859** | 0.57 | 375 | 1.51 | 0.286 | | 52.7 | 0.095 | 22.08 |
| **3861** | 0.44 | 326 | 0.32 | 0.047 | | 10.9 | 0.051 | 4.83 |
| **3862** | 0.69 | 806 | 1.81 | 0.241 | | 48 | 0.104 | 19.02 |
| **3863** | 0.66 | 679 | 1.6 | 0.161 | | 34.7 | 0.11 | 11.02 |
| **3864** | 0.63 | 553 | 1.39 | 0.196 | | 41.2 | 0.108 | 13.48 |
| **3865** | 0.63 | 659 | 1.26 | 0.251 | | 44.7 | 0.086 | 17.56 |
| **3866** | 0.59 | 500 | 1.66 | 0.179 | | 42.3 | 0.102 | 11.67 |
| **3867** | 0.71 | 625 | 1.69 | 0.21 | | 44.3 | 0.117 | 14.86 |
| **3869** | 0.32 | 74 | 1.48 | 0.229 | | 40.3 | 0.052 | 18.2 |
| **3871** | 0.36 | 83 | 1.82 | 0.236 | | 43.1 | 0.06 | 19.03 |
| **3873** | 0.33 | 69 | 1.4 | 0.237 | | 41.2 | 0.064 | 18.5 |

| **Element** | **Pd** | **Pt** | **Rb** | **Re** | **S** | **Sb** | **Sc** | **Se** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **10** | **2** | **0.1** | **1** | **0.02** | **0.02** | **0.1** | **0.1** |
| **Samples** | **ppb** | **ppb** | **ppm** | **ppb** | **%** | **ppm** | **ppm** | **ppm** |
| **3814** | | | | | 2.6 | 1.11 | 4.9 | 2.8 |
| **3815** | | | | | 3.04 | 1.04 | 5.5 | 2.8 |
| **3817** | | | | | 2.14 | 0.9 | 5.1 | 2.2 |
| **3818** | | | | | 2.32 | 0.78 | 4.9 | 2 |
| **3819** | | | | | 2.29 | 0.87 | 5.3 | 1.9 |
| **3820** | | | | | 2.32 | 0.82 | 5.2 | 2 |
| **3821** | | | | | 2.89 | 0.83 | 4.8 | 1.8 |
| **3822** | | | | | 2.38 | 0.65 | 5.6 | 1.6 |
| **3823** | | | | | 2.21 | 0.71 | 5.2 | 1.6 |
| **3824** | | | | | 2.28 | 0.72 | 5.5 | 1.6 |
| **3825** | | | | | 2.16 | 0.6 | 5.4 | 1.5 |
| **3826** | | | | | 2 | 0.53 | 5.9 | 1.3 |
| **3827** | | | | | 2.67 | 1.25 | 4.9 | 2.8 |
| **3830** | | | | | 2.82 | 1.22 | 4.6 | 2.8 |
| **3831** | | | | | 2.84 | 1.36 | 5 | 3 |
| **3832** | | | | | 2.94 | 1.18 | 5 | 2.5 |
| **3833** | | | | | 2.99 | 1.27 | 5.7 | 3.2 |
| **3834** | | | | | 2.81 | 0.98 | 5.5 | 2.6 |
| **3835** | | | | | 2.03 | 0.94 | 4.6 | 2.5 |
| **3836** | | | | | 2.08 | 0.87 | 4.8 | 2.2 |
| **3837** | | | | | 2.3 | 0.95 | 5 | 2.2 |
| **3838** | | | | | 2.26 | 0.83 | 5.1 | 1.9 |
| **3839** | | | | | 2.26 | 0.82 | 4.8 | 1.9 |
| **3840** | | | | | 2.16 | 0.82 | 5.1 | 2 |
| **3841** | | | | | 2.23 | 0.69 | 4.9 | 1.5 |
| **3845** | | | | | 1.09 | 0.7 | 2.8 | 0.9 |
| **3846** | | | | | 0.95 | 0.39 | 4.1 | 0.7 |
| **3847** | | | | | 1.06 | 0.63 | 4.5 | 0.9 |
| **3848** | | | | | 0.18 | 0.44 | 5 | 1.5 |
| **3849** | | | | | 0.27 | 0.61 | 7.8 | 1 |
| **3850** | | | | | 0.04 | 0.38 | 5.4 | 1.4 |
| **3851** | | | | | 0.03 | 0.36 | 6.3 | 1.4 |
| **3852** | | | | | 0.04 | 0.49 | 5.7 | 1.4 |
| **3853** | | | | | 0.17 | 0.51 | 6 | 1.3 |
| **3854** | | | | | 0.09 | 0.64 | 15.5 | 0.9 |
| **3855** | | | | | 0.77 | 1.18 | 5.6 | 1.1 |
| **3856** | | | | | 0.21 | 0.89 | 5.8 | 1.3 |
| **3859** | | | | | 0.14 | 0.68 | 6 | 1.3 |
| **3861** | | | | | 0.06 | 0.64 | 1.9 | 0.3 |
| **3862** | | | | | 0.06 | 0.62 | 5.7 | 1.3 |
| **3863** | | | | | 0.07 | 0.6 | 6.3 | 1 |
| **3864** | | | | | 0.04 | 0.62 | 5.9 | 1.1 |
| **3865** | | | | | 0.04 | 0.63 | 6.2 | 1.5 |
| **3866** | | | | | 0.05 | 0.68 | 5.1 | 0.9 |
| **3867** | | | | | 0.05 | 0.7 | 6.2 | 1.2 |
| **3869** | | | | | 1.85 | 0.26 | 2.9 | 1 |
| **3871** | | | | | 2.08 | 0.37 | 3.7 | 1.3 |
| **3873** | | | | | 2.13 | 0.32 | 3.4 | 1.1 |

| **Element** | **Sn** | **Sr** | **Ta** | **Te** | **Th** | **Ti** | **Tl** | **U** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.5** | **0.05** | **0.02** | **0.1** | **0.001** | **0.02** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **3814** | | 97.2 | | 0.1 | 4.2 | < .001 | 0.21 | 1.4 |
| **3815** | | 97.3 | | 0.12 | 4.4 | < .001 | 0.22 | 1.45 |
| **3817** | | 98.6 | | 0.07 | 4 | 0.003 | 0.14 | 1.35 |
| **3818** | | 82.2 | | 0.09 | 4 | < .001 | 0.12 | 1.3 |
| **3819** | | 85.3 | | 0.09 | 4.2 | < .001 | 0.14 | 1.13 |
| **3820** | | 88.2 | | 0.08 | 4.2 | < .001 | 0.11 | 1.25 |
| **3821** | | 80.2 | | 0.07 | 4.8 | 0.002 | 0.14 | 1.02 |
| **3822** | | 89.2 | | 0.12 | 4.4 | < .001 | 0.07 | 1.11 |
| **3823** | | 87.1 | | 0.1 | 4.2 | 0.003 | 0.12 | 0.91 |
| **3824** | | 89.4 | | 0.06 | 4.3 | < .001 | 0.1 | 0.94 |
| **3825** | | 87 | | 0.07 | 4.2 | < .001 | 0.08 | 0.88 |
| **3826** | | 90.7 | | 0.06 | 4 | < .001 | 0.05 | 0.95 |
| **3827** | | 169.7 | | 0.12 | 4.5 | < .001 | 0.22 | 2.43 |
| **3830** | | 124.3 | | 0.11 | 4.6 | 0.002 | 0.18 | 2.09 |
| **3831** | | 114.8 | | 0.15 | 4.6 | < .001 | 0.24 | 1.92 |
| **3832** | | 104.3 | | 0.11 | 4.2 | < .001 | 0.22 | 1.68 |
| **3833** | | 108.9 | | 0.16 | 4.3 | < .001 | 0.29 | 1.74 |
| **3834** | | 109.1 | | 0.11 | 4.4 | < .001 | 0.21 | 1.53 |
| **3835** | | 99 | | 0.08 | 4.1 | < .001 | 0.17 | 1.66 |
| **3836** | | 82.8 | | 0.1 | 4.3 | < .001 | 0.18 | 1.63 |
| **3837** | | 87.8 | | 0.09 | 4.3 | < .001 | 0.18 | 1.46 |
| **3838** | | 85.4 | | 0.08 | 4.5 | 0.003 | 0.18 | 1.44 |
| **3839** | | 83.4 | | 0.08 | 4.2 | < .001 | 0.17 | 1.11 |
| **3840** | | 91.3 | | 0.13 | 4.5 | < .001 | 0.15 | 1.23 |
| **3841** | | 90.5 | | 0.09 | 4.4 | < .001 | 0.08 | 1.24 |
| **3845** | | 251.3 | | < .02 | 3.2 | < .001 | 0.27 | 0.55 |
| **3846** | | 43.8 | | 0.03 | 5.1 | < .001 | 0.11 | 0.82 |
| **3847** | | 47.5 | | 0.04 | 5.4 | 0.001 | 0.11 | 0.81 |
| **3848** | | 71.8 | | 0.09 | 7.1 | 0.003 | 0.09 | 1.11 |
| **3849** | | 83 | | 0.04 | 5.1 | < .001 | 0.07 | 1.13 |
| **3850** | | 69.3 | | 0.07 | 7.3 | < .001 | 0.1 | 1.17 |
| **3851** | | 72.5 | | 0.08 | 7.1 | < .001 | 0.08 | 1.08 |
| **3852** | | 72.3 | | 0.08 | 7.1 | 0.001 | 0.09 | 1.1 |
| **3853** | | 79.5 | | 0.06 | 7.5 | < .001 | 0.08 | 1.13 |
| **3854** | | 127.1 | | 0.04 | 4.9 | 0.008 | 0.07 | 1.15 |
| **3855** | | 63.9 | | 0.06 | 7.1 | < .001 | 0.15 | 1.05 |
| **3856** | | 72.7 | | 0.07 | 7.7 | < .001 | 0.1 | 1.06 |
| **3859** | | 75.7 | | 0.11 | 8.2 | < .001 | 0.1 | 1.11 |
| **3861** | | 310.5 | | 0.02 | 4.5 | 0.001 | 0.05 | 0.51 |
| **3862** | | 72.1 | | 0.06 | 7.8 | < .001 | 0.1 | 1.33 |
| **3863** | | 57.9 | | 0.02 | 5.3 | 0.003 | 0.07 | 1.15 |
| **3864** | | 61.9 | | 0.03 | 6.5 | 0.001 | 0.08 | 1.16 |
| **3865** | | 71.6 | | 0.07 | 7 | 0.001 | 0.08 | 1.14 |
| **3866** | | 55.9 | | 0.04 | 5.9 | < .001 | 0.07 | 0.99 |
| **3867** | | 65 | | 0.03 | 6.6 | 0.009 | 0.09 | 1.22 |
| **3869** | | 41.5 | | 0.08 | 4.1 | 0.001 | 0.07 | 0.68 |
| **3871** | | 47.8 | | 0.05 | 4.2 | < .001 | 0.08 | 0.79 |
| **3873** | | 46.5 | | 0.07 | 4.5 | 0.003 | 0.08 | 0.74 |

***Analysis: GROUP 1EX - 0.25 GM***

| **Element** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ag** | **Al** | **As** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.1** | **0.01** | **0.1** | **0.1** | **0.1** | **0.01** | **1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** |
| **3814** | 41 | < .1 | | 156.3 | | | | |
| **3815** | 35 | < .1 | | 175.1 | | | | |
| **3817** | 26 | < .1 | | 146.4 | | | | |
| **3818** | 25 | < .1 | | 109.1 | | | | |
| **3819** | 26 | < .1 | | 134.2 | | | | |
| **3820** | 27 | < .1 | | 133.8 | | | | |
| **3821** | 26 | < .1 | | 98.9 | | | | |
| **3822** | 27 | < .1 | | 133.5 | | | | |
| **3823** | 28 | < .1 | | 180.7 | | | | |
| **3824** | 27 | < .1 | | 114.1 | | | | |
| **3825** | 25 | < .1 | | 111.3 | | | | |
| **3826** | 31 | < .1 | | 98.3 | | | | |
| **3827** | 35 | < .1 | | 132.4 | | | | |
| **3830** | 31 | < .1 | | 164 | | | | |
| **3831** | 37 | < .1 | | 158.3 | | | | |
| **3832** | 32 | < .1 | | 149.5 | | | | |
| **3833** | 35 | < .1 | | 171.1 | | | | |
| **3834** | 33 | < .1 | | 162.8 | | | | |
| **3835** | 27 | < .1 | | 161.8 | | | | |
| **3836** | 24 | < .1 | | 127.3 | | | | |
| **3837** | 28 | < .1 | | 184.2 | | | | |
| **3838** | 25 | < .1 | | 124.2 | | | | |
| **3839** | 26 | < .1 | | 130.5 | | | | |
| **3840** | 28 | < .1 | | 134.3 | | | | |
| **3841** | 25 | < .1 | | 168.4 | | | | |
| **3845** | 11 | < .1 | | 27.3 | | | | |
| **3846** | 30 | < .1 | | 106.6 | | | | |
| **3847** | 31 | < .1 | | 121.3 | | | | |
| **3848** | 41 | < .1 | | 169.1 | | | | |
| **3849** | 44 | < .1 | | 119.9 | | | | |
| **3850** | 46 | < .1 | | 152.8 | | | | |
| **3851** | 46 | < .1 | | 159 | | | | |
| **3852** | 46 | < .1 | | 164.4 | | | | |
| **3853** | 44 | < .1 | | 183.9 | | | | |
| **3854** | 72 | < .1 | | 137.5 | | | | |
| **3855** | 45 | < .1 | | 147.6 | | | | |
| **3856** | 43 | < .1 | | 162.9 | | | | |
| **3859** | 45 | < .1 | | 173.8 | | | | |
| **3861** | 22 | < .1 | | 38.8 | | | | |
| **3862** | 47 | < .1 | | 135.5 | | | | |
| **3863** | 35 | < .1 | | 118.3 | | | | |
| **3864** | 40 | < .1 | | 135.6 | | | | |
| **3865** | 46 | < .1 | | 155.6 | | | | |
| **3866** | 37 | < .1 | | 131.6 | | | | |
| **3867** | 45 | < .1 | | 135.8 | | | | |
| **3869** | 27 | < .1 | | 100.3 | | | | |
| **3871** | 33 | < .1 | | 110 | | | | |
| **3873** | 29 | < .1 | | 151.8 | | | | |

| **Samples** | **Hole** | **Latitude** | **Longitude** | **From (m)** | **To (m)** | **Analysis Date** |
|---|---|---|---|---|---|---|
| **3875** | 02/06-30-064-01W6/0 | 54.565516 | -118.138962 | 1558.400 | 1558.450 | Dec. 2003 |
| **3876** | 02/06-30-064-01W6/0 | 54.565516 | -118.138962 | 1559.330 | 1559.400 | Dec. 2003 |
| **3877** | 02/06-30-064-01W6/0 | 54.565516 | -118.138962 | 1560.390 | 1560.460 | Dec. 2003 |
| **3878** | 02/06-30-064-01W6/0 | 54.565516 | -118.138962 | 1561.375 | 1561.445 | Dec. 2003 |
| **3879** | 02/06-30-064-01W6/0 | 54.565516 | -118.138962 | 1562.430 | 1560.500 | Dec. 2003 |
| **3880** | 02/06-30-064-01W6/0 | 54.565516 | -118.138962 | 1563.480 | 1563.500 | Dec. 2003 |
| **3882** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1875.450 | 1875.510 | Dec. 2003 |
| **3884** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1876.450 | 1876.520 | Dec. 2003 |
| **3885** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1877.435 | 1877.505 | Dec. 2003 |
| **3886** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1878.455 | 1878.525 | Dec. 2003 |
| **3887** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1879.400 | 1879.470 | Dec. 2003 |
| **3888** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1880.310 | 1880.380 | Dec. 2003 |
| **3889** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1881.340 | 1881.400 | Dec. 2003 |
| **3890** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1881.560 | 1881.610 | Dec. 2003 |
| **3891** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1882.350 | 1882.420 | Dec. 2003 |
| **3894** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1883.220 | 1883.290 | Dec. 2003 |
| **3895** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1884.365 | 1884.435 | Dec. 2003 |
| **3896** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1885.275 | 1885.355 | Dec. 2003 |
| **3897** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1886.320 | 1886.400 | Dec. 2003 |
| **3898** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1887.290 | 1887.360 | Dec. 2003 |
| **3899** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1888.300 | 1888.360 | Dec. 2003 |
| **3900** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1889.230 | 1889.300 | Dec. 2003 |
| **3901** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1890.320 | 1890.390 | Dec. 2003 |
| **3907** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1891.360 | 1891.430 | Dec. 2003 |
| **3909** | 00/14-28-062-05W6/0 | 54.39630 | -118.689728 | 1892.330 | 1892.400 | Dec. 2003 |
| **3910** | 02/16-18-064-02W6/0 | 54.541641 | -118.281382 | 1696.480 | 1696.550 | Dec. 2003 |
| **3911** | 02/16-18-064-02W6/0 | 54.541641 | -118.281382 | 1697.480 | 1697.530 | Dec. 2003 |
| **3912** | 02/16-18-064-02W6/0 | 54.541641 | -118.281382 | 1698.470 | 1698.540 | Dec. 2003 |
| **3913** | 02/16-18-064-02W6/0 | 54.541641 | -118.281382 | 1699.450 | 1699.520 | Dec. 2003 |
| **3914** | 02/16-18-064-02W6/0 | 54.541641 | -118.281382 | 1700.410 | 1700.480 | Dec. 2003 |
| **3915** | 02/16-18-064-02W6/0 | 54.541641 | -118.281382 | 1701.550 | 1701.600 | Dec. 2003 |
| **3917** | 02/16-18-064-02W6/0 | 54.541641 | -118.281382 | 1702.440 | 1702.510 | Dec. 2003 |
| **3918** | 02/16-18-064-02W6/0 | 54.541641 | -118.281382 | 1703.425 | 1703.495 | Dec. 2003 |
| **3919** | 02/16-18-064-02W6/0 | 54.541641 | -118.281382 | 1704.400 | 1704.470 | Dec. 2003 |
| **3920** | 02/16-18-064-02W6/0 | 54.541641 | -118.281382 | 1705.380 | 1705.440 | Dec. 2003 |
| **3921** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 735.490 | 735.560 | Dec. 2003 |
| **3922** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 736.505 | 736.575 | Dec. 2003 |
| **3923** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 737.525 | 737.595 | Dec. 2003 |
| **3924** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 738.425 | 738.495 | Dec. 2003 |
| **3925** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 739.470 | 739.540 | Dec. 2003 |
| **3926** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 740.465 | 740.535 | Dec. 2003 |
| **3927** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 741.440 | 741.510 | Dec. 2003 |
| **3928** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 742.470 | 742.540 | Dec. 2003 |
| **3929** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 743.480 | 743.550 | Dec. 2003 |
| **3930** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 744.480 | 744.550 | Dec. 2003 |

| **Samples** | **Probability of Fm** | **Formation** | **Sample Description** |
|---|---|---|---|
| 3875 | Possible/Unknown | Belle Fourche | Dk grey shale and sand lams, micas, fish debris |
| 3876 | Possible/Unknown | Belle Fourche | Dk grey shale with some sand lams/ripples |
| 3877 | Possible/Unknown | Belle Fourche | Dk grey shale with some beige/yellow sand lams/ripples |
| 3878 | Possible/Unknown | Belle Fourche | Sand/shale lams, dk grey shale |
| 3879 | Possible/Unknown | Belle Fourche | Sand/shale lams, some white specks, some black organic debris |
| 3880 | Possible/Unknown | Belle Fourche | Dk grey shale with some sand lams/ripples |
| 3882 | Unknown | SWS? | Broken fragments of shale, sandy pockets and lams, mica rich |
| 3884 | Unknown | SWS? | Bioturbated sand/shale, micas |
| 3885 | Unknown | SWS? | Bioturbated sand/shale, micas |
| 3886 | Unknown | SWS? | Bioturbated sand/shale, micas |
| 3887 | Unknown | SWS? | Bioturbated sand/shale, some silt and micas |
| 3888 | Unknown | SWS? | Bioturbated sand/shale (little sand), shale is dk grey coloured, some silt |
| 3889 | Unknown | SWS? | Sandy/silty shale, a few fish remains |
| 3890 | Unknown | SWS? | Py filled burrows |
| 3891 | Unknown | SWS? | Silty/sandy dk grey shale |
| 3894 | Unknown | SWS? | Bioturbated sand/shale, white coloured sand |
| 3895 | Unknown | SWS? | Bioturbated sand/shale, micas, white coloured sand |
| 3896 | Unknown | SWS? | Bioturbated sand/shale, white coloured sand, micas |
| 3897 | Unknown | SWS? | Bioturbated sand/shale, sand is white coloured |
| 3898 | Unknown | SWS? | Bioturbated sand/shale, white coloured sand |
| 3899 | Unknown | SWS? | Rubble shale, dk grey, some silt |
| 3900 | Unknown | SWS? | Rubble , dk grey, some silty/sandy lams, micas |
| 3901 | Unknown | SWS? | Rubble shale, dk grey in colour, some pockets of silt |
| 3907 | Unknown | SWS? | Rubbly shale, dk grey, some silt, micas |
| 3909 | Unknown | SWS? | Sand/shale lams, some silt, mica rich |
| 3910 | Unknown | Second White Specks | Dk grey shale with VF sand lams, micas - slightly calcareous |
| 3911 | Unknown | Second White Specks | Dk grey shale with VF sand lams - slightly calcareous |
| 3912 | Unknown | Second White Specks | Dk grey shale with VF sand lams, some silt, some micas - slightly calcareous |
| 3913 | Unknown | Second White Specks | Dk grey shale with VF sand lams, some silt - slightly calcareous |
| 3914 | Unknown | Second White Specks | Dk grey shale and VF sand lams - slightly calcareous |
| 3915 | Unknown | Second White Specks | Dk grey shale with VF sand lams/ripples/soft sed deformation - slightly calcareous |
| 3917 | Unknown | Second White Specks | Dk grey shale with VF sand lams, some silt, and black organic debris |
| 3918 | Unknown | Second White Specks | Dk grey shale and VF sand lams |
| 3919 | Unknown | Second White Specks | Dk grey shale with VF sand lams (contorted, soft sed deformation) |
| 3920 | Unknown | Second White Specks | Dk grey shale with VF sand lams, slightly undulatory, micas |
| 3921 | Unknown | Not SWS (Below FS?) | Dk grey shale, sandy lams, micas |
| 3922 | Unknown | Not SWS (Below FS?) | Dk grey shale, mica rich |
| 3923 | Unknown | Not SWS (Below FS?) | Dk grey shale, some sandy lams, micas |
| 3924 | Unknown | Not SWS (Below FS?) | Dk grey shale, micas, silt, brown coloured fragments |
| 3925 | Unknown | Not SWS (Below FS?) | Dk grey shale, micas, shell fragments, silty/sandy pockets |
| 3926 | Unknown | Not SWS (Below FS?) | Dk grey shale, micas, shell debris |
| 3927 | Unknown | Not SWS (Below FS?) | Bioturbated sand/shale, micas |
| 3928 | Unknown | Not SWS (Below FS?) | Bioturbated sand/shale, micas |
| 3929 | Unknown | Not SWS (Below FS?) | Bioturbated sand/shale, micas |
| 3930 | Unknown | Not SWS (Below FS?) | Bioturbated sand/shale, sand is whitish coloured |

***Analysis: GROUP 1F1 - 1.00 GM***

| **Element** | **Ag** | **Al** | **As** | **Au** | **B** | **Ba** | **Be** | **Bi** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** | **0.1** | **0.02** |
| **Samples** | **ppb** | **%** | **ppm** | **ppb** | **ppm** | **ppm** | **ppm** | **ppm** |
| **3875** | 210 | 0.83 | 19.4 | 0.5 | 10 | 49.4 |  | 0.29 |
| **3876** | 200 | 0.57 | 17.6 | 0.2 | 9 | 64.1 |  | 0.21 |
| **3877** | 220 | 0.61 | 16.6 | 0.3 | 8 | 68.9 |  | 0.22 |
| **3878** | 218 | 0.77 | 18.2 | 0.5 | 11 | 67.6 |  | 0.27 |
| **3879** | 233 | 0.82 | 20 | 0.3 | 11 | 72.3 |  | 0.24 |
| **3880** | 233 | 0.66 | 19 | 0.4 | 11 | 77.2 |  | 0.22 |
| **3882** | 144 | 1.07 | 20.2 | 0.4 | 9 | 275.5 |  | 0.22 |
| **3884** | 219 | 0.69 | 12.9 | < .2 | 9 | 389.4 |  | 0.14 |
| **3885** | 198 | 0.77 | 17 | < .2 | 8 | 443.9 |  | 0.2 |
| **3886** | 169 | 0.66 | 10.9 | 0.5 | 9 | 413.9 |  | 0.14 |
| **3887** | 188 | 0.75 | 21 | < .2 | 9 | 445.7 |  | 0.17 |
| **3888** | 187 | 0.86 | 10.5 | 0.3 | 10 | 540.7 |  | 0.17 |
| **3889** | 151 | 0.85 | 8.9 | < .2 | 10 | 533.7 |  | 0.18 |
| **3890** | 164 | 0.83 | 16.8 | 0.5 | 10 | 194 |  | 0.17 |
| **3891** | 177 | 1.02 | 16.4 | 0.2 | 10 | 571.3 |  | 0.21 |
| **3894** | 161 | 0.65 | 32.9 | 0.2 | 8 | 378.9 |  | 0.19 |
| **3895** | 181 | 0.76 | 26 | 0.2 | 7 | 441.7 |  | 0.19 |
| **3896** | 159 | 0.89 | 21.6 | < .2 | 9 | 487.3 |  | 0.19 |
| **3897** | 171 | 0.51 | 39.7 | 0.5 | 6 | 286.3 |  | 0.22 |
| **3898** | 167 | 0.72 | 17.2 | 0.7 | 8 | 448 |  | 0.18 |
| **3899** | 298 | 1.03 | 19 | 0.5 | 12 | 294.7 |  | 0.25 |
| **3900** | 217 | 0.83 | 13 | 0.3 | 10 | 165.9 |  | 0.19 |
| **3901** | 228 | 0.91 | 11.1 | < .2 | 9 | 590.8 |  | 0.21 |
| **3907** | 205 | 0.79 | 10.9 | 0.3 | 10 | 528.1 |  | 0.19 |
| **3909** | 263 | 0.74 | 3.9 | < .2 | 10 | 571.1 |  | 0.13 |
| **3910** | 174 | 0.91 | 18.1 | 0.2 | 11 | 81.4 |  | 0.3 |
| **3911** | 191 | 0.87 | 15.7 | 0.3 | 11 | 64.7 |  | 0.29 |
| **3912** | 199 | 0.96 | 14.6 | 0.4 | 12 | 67.3 |  | 0.31 |
| **3913** | 211 | 0.68 | 18.4 | 0.3 | 13 | 76.3 |  | 0.21 |
| **3914** | 233 | 0.65 | 14.1 | 0.6 | 11 | 78.2 |  | 0.19 |
| **3915** | 244 | 0.72 | 19 | 0.7 | 11 | 59 |  | 0.24 |
| **3917** | 212 | 0.58 | 19 | 0.7 | 8 | 54.4 |  | 0.2 |
| **3918** | 224 | 0.65 | 26.7 | 0.5 | 11 | 54.5 |  | 0.22 |
| **3919** | 223 | 0.67 | 21 | 0.6 | 12 | 68.4 |  | 0.22 |
| **3920** | 209 | 0.65 | 19 | < .2 | 10 | 66.2 |  | 0.21 |
| **3921** | 90 | 1.13 | 17 | 0.6 | 12 | 376.4 |  | 0.25 |
| **3922** | 81 | 1.16 | 11.3 | 0.4 | 11 | 387 |  | 0.24 |
| **3923** | 78 | 1.13 | 11.1 | 0.3 | 14 | 354.7 |  | 0.23 |
| **3924** | 81 | 1.22 | 10.4 | 0.4 | 14 | 364 |  | 0.24 |
| **3925** | 68 | 0.94 | 10.2 | 0.5 | 13 | 395 |  | 0.19 |
| **3926** | 84 | 1.1 | 19.9 | 0.6 | 10 | 369.6 |  | 0.23 |
| **3927** | 80 | 0.63 | 11.2 | 0.2 | 9 | 217.2 |  | 0.14 |
| **3928** | 101 | 0.75 | 15.6 | 0.3 | 11 | 264.3 |  | 0.19 |
| **3929** | 100 | 0.84 | 14.1 | 0.5 | 10 | 316.5 |  | 0.18 |
| **3930** | 64 | 0.28 | 5.8 | 0.9 | 9 | 207.6 |  | 0.06 |

| **Element** | **Ca** | **Cd** | **Ce** | **Co** | **Cr** | **Cs** | **Cu** | **Fe** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **0.01** | **0.1** | **0.1** | **0.5** | **0.02** | **0.01** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **3875** | 0.41 | 0.27 | | 10.9 | 14.7 | | 29.93 | 3.02 |
| **3876** | 1.12 | 0.28 | | 7.6 | 11.8 | | 21.17 | 3.08 |
| **3877** | 0.54 | 0.3 | | 8.4 | 13 | | 23.6 | 2.51 |
| **3878** | 0.64 | 0.34 | | 10.1 | 14.4 | | 28.92 | 2.92 |
| **3879** | 0.78 | 0.4 | | 10.6 | 14.3 | | 28.66 | 3 |
| **3880** | 2.63 | 0.42 | | 9.5 | 13.8 | | 25.71 | 3.1 |
| **3882** | 0.33 | 0.14 | | 11.7 | 19.9 | | 23.51 | 2.04 |
| **3884** | 0.43 | 0.15 | | 9 | 16 | | 19.06 | 1.24 |
| **3885** | 0.29 | 0.17 | | 12.1 | 17.4 | | 23.65 | 1.59 |
| **3886** | 0.37 | 0.11 | | 8.6 | 14.4 | | 18.63 | 1.33 |
| **3887** | 0.34 | 0.13 | | 10.8 | 15.3 | | 21.7 | 1.58 |
| **3888** | 0.39 | 0.14 | | 10.8 | 17.4 | | 22.32 | 1.68 |
| **3889** | 0.25 | 0.12 | | 7.9 | 15.6 | | 22.54 | 1.42 |
| **3890** | 0.26 | 0.14 | | 10.8 | 16.1 | | 20.47 | 2.23 |
| **3891** | 0.21 | 0.16 | | 12 | 21.8 | | 23.1 | 2 |
| **3894** | 0.23 | 0.11 | | 17.1 | 16.3 | | 19.25 | 1.28 |
| **3895** | 0.22 | 0.12 | | 12.1 | 18.3 | | 20.48 | 1.49 |
| **3896** | 0.22 | 0.15 | | 11.8 | 19.8 | | 21.72 | 1.9 |
| **3897** | 0.12 | 0.08 | | 19.4 | 16.3 | | 17.2 | 1.32 |
| **3898** | 0.13 | 0.08 | | 10.4 | 16.9 | | 18.17 | 1.38 |
| **3899** | 0.52 | 0.19 | | 10.7 | 19.1 | | 34.73 | 1.88 |
| **3900** | 0.35 | 0.16 | | 9.2 | 15.2 | | 25.27 | 2.06 |
| **3901** | 0.22 | 0.17 | | 9.7 | 17.1 | | 28.08 | 1.44 |
| **3907** | 0.16 | 0.15 | | 9.4 | 15.4 | | 25.52 | 1.25 |
| **3909** | 0.6 | 0.25 | | 9.9 | 19.3 | | 21.04 | 5.71 |
| **3910** | 0.42 | 0.15 | | 9.6 | 16.1 | | 29.64 | 2.67 |
| **3911** | 0.59 | 0.29 | | 10.6 | 15.4 | | 29.84 | 2.8 |
| **3912** | 0.51 | 0.2 | | 10.5 | 16.1 | | 30.94 | 2.93 |
| **3913** | 0.59 | 0.26 | | 8.1 | 12.7 | | 21.45 | 2.58 |
| **3914** | 0.55 | 0.23 | | 7.5 | 13.3 | | 21.4 | 2.33 |
| **3915** | 0.48 | 0.31 | | 9.7 | 14.4 | | 25.85 | 2.84 |
| **3917** | 0.6 | 0.28 | | 7.5 | 14.1 | | 20.98 | 2.81 |
| **3918** | 0.43 | 0.29 | | 8.9 | 14 | | 24.12 | 2.56 |
| **3919** | 0.63 | 0.3 | | 8.8 | 13.4 | | 22.9 | 2.63 |
| **3920** | 0.55 | 0.31 | | 8.3 | 12.4 | | 21.75 | 2.59 |
| **3921** | 0.19 | 0.06 | | 11.9 | 21.5 | | 22.64 | 2.03 |
| **3922** | 0.23 | 0.05 | | 12.5 | 22.1 | | 20.6 | 2.29 |
| **3923** | 0.2 | 0.07 | | 11.7 | 21.9 | | 20.12 | 2.25 |
| **3924** | 0.16 | 0.07 | | 11.5 | 24 | | 21.32 | 1.98 |
| **3925** | 0.66 | 0.06 | | 10.1 | 17.9 | | 16.22 | 6.79 |
| **3926** | 0.18 | 0.05 | | 12.4 | 21.3 | | 21.39 | 1.88 |
| **3927** | 0.15 | 0.03 | | 6.9 | 13 | | 11.82 | 1.22 |
| **3928** | 0.14 | 0.03 | | 9.2 | 15.7 | | 14 | 1.26 |
| **3929** | 0.11 | 0.05 | | 10.1 | 16.7 | | 14.03 | 1.32 |
| **3930** | 4.82 | 0.03 | | 3.6 | 6.7 | | 3.82 | 4.36 |

| **Element**<br>**LDL**<br>**Samples** | **Ga**<br>**0.1**<br>**ppm** | **Ge**<br>**0.1**<br>**ppm** | **Hf**<br>**0.02**<br>**ppm** | **Hg**<br>**5**<br>**ppb** | **In**<br>**0.02**<br>**ppm** | **K**<br>**0.01**<br>**%** | **La**<br>**0.5**<br>**ppm** | **Li**<br>**0.1**<br>**ppm** |
|---|---|---|---|---|---|---|---|---|
| **3875** | 2.8 | | | 102 | | 0.23 | 4.8 | |
| **3876** | 2.1 | | | 79 | | 0.17 | 5.5 | |
| **3877** | 2.3 | | | 85 | | 0.18 | 4.9 | |
| **3878** | 2.7 | | | 93 | | 0.22 | 4.6 | |
| **3879** | 2.8 | | | 86 | | 0.21 | 5.7 | |
| **3880** | 2.3 | | | 85 | | 0.19 | 4.7 | |
| **3882** | 3.3 | | | 84 | | 0.23 | 3.3 | |
| **3884** | 2.2 | | | 71 | | 0.18 | 5.2 | |
| **3885** | 2.5 | | | 68 | | 0.19 | 4.5 | |
| **3886** | 2.2 | | | 69 | | 0.17 | 5.5 | |
| **3887** | 2.3 | | | 86 | | 0.2 | 4.5 | |
| **3888** | 2.6 | | | 58 | | 0.23 | 5.5 | |
| **3889** | 2.5 | | | 46 | | 0.21 | 4.7 | |
| **3890** | 2.5 | | | 58 | | 0.22 | 4 | |
| **3891** | 3.7 | | | 54 | | 0.22 | 5 | |
| **3894** | 2.2 | | | 52 | | 0.17 | 3.7 | |
| **3895** | 2.4 | | | 60 | | 0.2 | 3.6 | |
| **3896** | 3 | | | 82 | | 0.21 | 3.8 | |
| **3897** | 1.9 | | | 68 | | 0.13 | 2.1 | |
| **3898** | 2.2 | | | 72 | | 0.18 | 3.6 | |
| **3899** | 3.1 | | | 98 | | 0.28 | 5.7 | |
| **3900** | 2.8 | | | 110 | | 0.24 | 4.3 | |
| **3901** | 2.8 | | | 73 | | 0.26 | 4.8 | |
| **3907** | 2.5 | | | 69 | | 0.22 | 4.4 | |
| **3909** | 2.5 | | | 55 | | 0.19 | 7.3 | |
| **3910** | 3 | | | 88 | | 0.25 | 3.5 | |
| **3911** | 2.8 | | | 98 | | 0.24 | 3.4 | |
| **3912** | 3 | | | 95 | | 0.26 | 3.6 | |
| **3913** | 2.2 | | | 94 | | 0.19 | 6.1 | |
| **3914** | 2.1 | | | 78 | | 0.2 | 4.2 | |
| **3915** | 2.4 | | | 103 | | 0.22 | 5 | |
| **3917** | 1.9 | | | 79 | | 0.18 | 5.5 | |
| **3918** | 2.2 | | | 89 | | 0.2 | 4 | |
| **3919** | 2.3 | | | 86 | | 0.2 | 3.5 | |
| **3920** | 2.2 | | | 94 | | 0.19 | 3.4 | |
| **3921** | 3.8 | | | 69 | | 0.27 | 5.3 | |
| **3922** | 3.9 | | | 72 | | 0.27 | 5.9 | |
| **3923** | 3.7 | | | 55 | | 0.27 | 5.4 | |
| **3924** | 4.1 | | | 73 | | 0.29 | 5.3 | |
| **3925** | 3.2 | | | 77 | | 0.23 | 6.1 | |
| **3926** | 3.9 | | | 64 | | 0.27 | 5.5 | |
| **3927** | 2.5 | | | 41 | | 0.18 | 4.6 | |
| **3928** | 3 | | | 65 | | 0.21 | 5.7 | |
| **3929** | 3.5 | | | 94 | | 0.25 | 6 | |
| **3930** | 1.4 | | | 75 | | 0.1 | 6 | |

| **Element** | **Mg** | **Mn** | **Mo** | **Na** | **Nb** | **Ni** | **P** | **Pb** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **1** | **0.01** | **0.001** | **0.02** | **0.1** | **0.001** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** |
| **3875** | 0.29 | 75 | 3.58 | 0.192 | | 40.6 | 0.066 | 17.29 |
| **3876** | 0.44 | 95 | 3.34 | 0.122 | | 27.7 | 0.101 | 13.48 |
| **3877** | 0.23 | 68 | 3.35 | 0.136 | | 31.6 | 0.074 | 14.13 |
| **3878** | 0.3 | 65 | 3.39 | 0.177 | | 37.2 | 0.066 | 16.45 |
| **3879** | 0.34 | 85 | 5.3 | 0.166 | | 36.2 | 0.086 | 15.4 |
| **3880** | 0.42 | 88 | 5.51 | 0.15 | | 35.2 | 0.073 | 13.72 |
| **3882** | 0.38 | 55 | 0.97 | 0.163 | | 36.7 | 0.067 | 13.82 |
| **3884** | 0.31 | 54 | 0.84 | 0.103 | | 23.2 | 0.082 | 11.33 |
| **3885** | 0.28 | 60 | 2.22 | 0.122 | | 29.8 | 0.073 | 14.64 |
| **3886** | 0.27 | 55 | 1.2 | 0.105 | | 23 | 0.086 | 10.48 |
| **3887** | 0.31 | 68 | 2.96 | 0.121 | | 32.4 | 0.076 | 13.86 |
| **3888** | 0.33 | 76 | 1.86 | 0.134 | | 29.8 | 0.088 | 14.14 |
| **3889** | 0.29 | 60 | 0.91 | 0.138 | | 24.1 | 0.068 | 9.99 |
| **3890** | 0.28 | 62 | 3.47 | 0.13 | | 34 | 0.066 | 13.05 |
| **3891** | 0.3 | 60 | 0.5 | 0.143 | | 27.7 | 0.062 | 14.45 |
| **3894** | 0.24 | 54 | 1.48 | 0.102 | | 25.9 | 0.045 | 14.01 |
| **3895** | 0.25 | 55 | 0.37 | 0.122 | | 26.4 | 0.049 | 12.58 |
| **3896** | 0.29 | 60 | 0.55 | 0.133 | | 29.3 | 0.051 | 12.49 |
| **3897** | 0.17 | 59 | 0.51 | 0.08 | | 32.1 | 0.031 | 14.14 |
| **3898** | 0.21 | 54 | 0.6 | 0.112 | | 25 | 0.045 | 10.36 |
| **3899** | 0.4 | 93 | 4.53 | 0.181 | | 35.1 | 0.12 | 13.28 |
| **3900** | 0.34 | 71 | 1.94 | 0.154 | | 28 | 0.072 | 12.84 |
| **3901** | 0.27 | 60 | 1.11 | 0.157 | | 29.1 | 0.076 | 13.32 |
| **3907** | 0.22 | 40 | 1.78 | 0.139 | | 26.9 | 0.065 | 10.93 |
| **3909** | 0.52 | 396 | 1.14 | 0.112 | | 29.2 | 0.119 | 12.05 |
| **3910** | 0.33 | 84 | 1.44 | 0.203 | | 35.6 | 0.061 | 16.84 |
| **3911** | 0.33 | 75 | 2.04 | 0.199 | | 36.8 | 0.06 | 16.56 |
| **3912** | 0.34 | 78 | 1.73 | 0.219 | | 37.5 | 0.063 | 17.36 |
| **3913** | 0.21 | 69 | 3.56 | 0.124 | | 27.4 | 0.121 | 14.66 |
| **3914** | 0.23 | 64 | 2.16 | 0.124 | | 27.1 | 0.073 | 12.15 |
| **3915** | 0.25 | 77 | 3.93 | 0.144 | | 34.8 | 0.085 | 14.94 |
| **3917** | 0.26 | 84 | 3.67 | 0.112 | | 26.8 | 0.109 | 13.16 |
| **3918** | 0.23 | 71 | 3.28 | 0.14 | | 31.3 | 0.072 | 14.47 |
| **3919** | 0.27 | 69 | 3.16 | 0.15 | | 31.3 | 0.069 | 13.25 |
| **3920** | 0.24 | 58 | 3.11 | 0.142 | | 28.8 | 0.069 | 12.93 |
| **3921** | 0.36 | 100 | 0.52 | 0.2 | | 30.1 | 0.071 | 13.31 |
| **3922** | 0.38 | 111 | 0.51 | 0.198 | | 30.3 | 0.078 | 13.43 |
| **3923** | 0.37 | 105 | 0.32 | 0.195 | | 29.2 | 0.071 | 13.33 |
| **3924** | 0.38 | 71 | 0.36 | 0.199 | | 30.5 | 0.067 | 13.61 |
| **3925** | 0.7 | 334 | 0.5 | 0.172 | | 22.8 | 0.101 | 10.9 |
| **3926** | 0.33 | 69 | 0.6 | 0.216 | | 29.5 | 0.067 | 19.65 |
| **3927** | 0.19 | 65 | 0.28 | 0.13 | | 15.6 | 0.059 | 9.77 |
| **3928** | 0.21 | 58 | 0.3 | 0.148 | | 18.8 | 0.064 | 11.61 |
| **3929** | 0.22 | 44 | 0.18 | 0.17 | | 18.4 | 0.046 | 11.88 |
| **3930** | 0.4 | 305 | 0.13 | 0.053 | | 4.2 | 0.074 | 6.9 |

| **Element** | **Pd** | **Pt** | **Rb** | **Re** | **S** | **Sb** | **Sc** | **Se** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **10** | **2** | **0.1** | **1** | **0.02** | **0.02** | **0.1** | **0.1** |
| **Samples** | **ppb** | **ppb** | **ppm** | **ppb** | **%** | **ppm** | **ppm** | **ppm** |
| **3875** | | | | | 2.38 | 0.35 | 2.9 | 1.4 |
| **3876** | | | | | 1.97 | 0.39 | 4.1 | 1.3 |
| **3877** | | | | | 1.99 | 0.4 | 3.2 | 1.3 |
| **3878** | | | | | 2.22 | 0.37 | 3.9 | 1.5 |
| **3879** | | | | | 2.22 | 0.44 | 3.6 | 1.5 |
| **3880** | | | | | 2.19 | 0.39 | 5.3 | 1.5 |
| **3882** | | | | | 0.65 | 0.67 | 3.3 | 1 |
| **3884** | | | | | 0.28 | 0.57 | 2.3 | 0.7 |
| **3885** | | | | | 0.36 | 0.67 | 3.2 | 1 |
| **3886** | | | | | 0.25 | 0.56 | 2.5 | 0.9 |
| **3887** | | | | | 0.43 | 1.04 | 2.7 | 1 |
| **3888** | | | | | 0.19 | 0.52 | 3.5 | 0.9 |
| **3889** | | | | | 0.16 | 0.34 | 2.8 | 0.7 |
| **3890** | | | | | 0.97 | 0.73 | 2.8 | 0.9 |
| **3891** | | | | | 0.18 | 0.49 | 3.7 | 0.7 |
| **3894** | | | | | 0.28 | 0.52 | 1.8 | 0.5 |
| **3895** | | | | | 0.38 | 0.64 | 2.3 | 0.8 |
| **3896** | | | | | 0.43 | 0.58 | 3.2 | 0.9 |
| **3897** | | | | | 0.26 | 0.8 | 2.3 | 0.6 |
| **3898** | | | | | 0.36 | 0.63 | 2.5 | 0.7 |
| **3899** | | | | | 0.6 | 0.82 | 4 | 1.3 |
| **3900** | | | | | 0.83 | 0.74 | 2.3 | 1.1 |
| **3901** | | | | | 0.35 | 0.54 | 3.2 | 1.1 |
| **3907** | | | | | 0.34 | 0.65 | 2.6 | 1 |
| **3909** | | | | | 0.21 | 0.45 | 5.9 | 0.9 |
| **3910** | | | | | 1.7 | 0.26 | 3.4 | 1 |
| **3911** | | | | | 1.89 | 0.31 | 4.3 | 1.2 |
| **3912** | | | | | 2.2 | 0.3 | 3.2 | 1.1 |
| **3913** | | | | | 2.14 | 0.37 | 3.5 | 1.3 |
| **3914** | | | | | 1.83 | 0.33 | 3.7 | 1.1 |
| **3915** | | | | | 2.41 | 0.38 | 3.5 | 1.4 |
| **3917** | | | | | 2.23 | 0.37 | 4.2 | 1.4 |
| **3918** | | | | | 2.22 | 0.37 | 3.3 | 1.4 |
| **3919** | | | | | 2.13 | 0.38 | 3.8 | 1.4 |
| **3920** | | | | | 2.12 | 0.35 | 3.9 | 1.4 |
| **3921** | | | | | 0.31 | 0.2 | 3.5 | 0.5 |
| **3922** | | | | | 0.27 | 0.2 | 3.6 | 0.4 |
| **3923** | | | | | 0.34 | 0.18 | 3.7 | 0.4 |
| **3924** | | | | | 0.43 | 0.2 | 3.6 | 0.5 |
| **3925** | | | | | 0.33 | 0.17 | 5.4 | 0.4 |
| **3926** | | | | | 0.54 | 0.2 | 3.6 | 0.5 |
| **3927** | | | | | 0.28 | 0.12 | 1.8 | 0.2 |
| **3928** | | | | | 0.29 | 0.14 | 2 | 0.3 |
| **3929** | | | | | 0.29 | 0.14 | 3.2 | 0.3 |
| **3930** | | | | | 0.05 | 0.09 | 2.7 | 0.2 |

| Element | Sn | Sr | Ta | Te | Th | Ti | Tl | U |
|---|---|---|---|---|---|---|---|---|
| LDL | 0.1 | 0.5 | 0.05 | 0.02 | 0.1 | 0.001 | 0.02 | 0.1 |
| Samples | ppm | ppm | ppm | ppm | ppm | % | ppm | ppm |
| 3875 |  | 41.1 |  | 0.09 | 3.9 | < .001 | 0.12 | 0.74 |
| 3876 |  | 50.8 |  | 0.06 | 3.8 | 0.002 | 0.15 | 1.3 |
| 3877 |  | 40.9 |  | 0.05 | 4 | 0.003 | 0.15 | 1.12 |
| 3878 |  | 46.8 |  | 0.07 | 4.3 | 0.009 | 0.15 | 1.08 |
| 3879 |  | 62.9 |  | 0.06 | 4.1 | 0.003 | 0.21 | 1.31 |
| 3880 |  | 71.2 |  | 0.06 | 4.2 | 0.001 | 0.18 | 1.86 |
| 3882 |  | 40 |  | 0.08 | 3.9 | < .001 | 0.07 | 0.61 |
| 3884 |  | 37.5 |  | 0.06 | 4.8 | 0.002 | 0.07 | 0.69 |
| 3885 |  | 36.1 |  | 0.05 | 4.5 | 0.003 | 0.07 | 0.68 |
| 3886 |  | 34.6 |  | 0.04 | 5.1 | 0.004 | 0.06 | 0.68 |
| 3887 |  | 35.6 |  | 0.05 | 4.5 | 0.007 | 0.07 | 0.61 |
| 3888 |  | 41.7 |  | 0.06 | 4.9 | 0.001 | 0.05 | 0.8 |
| 3889 |  | 37.7 |  | 0.04 | 4.5 | 0.005 | 0.05 | 0.65 |
| 3890 |  | 32.5 |  | 0.07 | 3.9 | 0.006 | 0.06 | 0.63 |
| 3891 |  | 38.8 |  | 0.11 | 4.7 | 0.003 | 0.06 | 0.65 |
| 3894 |  | 30.2 |  | 0.11 | 4.1 | 0.008 | 0.06 | 0.49 |
| 3895 |  | 31.3 |  | 0.09 | 3.7 | 0.002 | 0.07 | 0.45 |
| 3896 |  | 33.1 |  | 0.06 | 3.7 | < .001 | 0.07 | 0.53 |
| 3897 |  | 23.6 |  | 0.14 | 3.7 | 0.006 | 0.07 | 0.43 |
| 3898 |  | 26.4 |  | 0.06 | 3.8 | 0.002 | 0.07 | 0.48 |
| 3899 |  | 53.5 |  | 0.08 | 5.4 | 0.007 | 0.08 | 1.12 |
| 3900 |  | 34.5 |  | 0.07 | 3.6 | 0.001 | 0.07 | 0.73 |
| 3901 |  | 41.7 |  | 0.05 | 4.6 | 0.005 | 0.06 | 0.71 |
| 3907 |  | 37.4 |  | 0.08 | 4.1 | 0.004 | 0.06 | 0.63 |
| 3909 |  | 46.5 |  | 0.04 | 4.5 | 0.003 | 0.04 | 1.62 |
| 3910 |  | 39.3 |  | 0.06 | 3.9 | 0.006 | 0.08 | 0.8 |
| 3911 |  | 41.7 |  | 0.1 | 4.2 | 0.001 | 0.08 | 0.98 |
| 3912 |  | 40.4 |  | 0.06 | 4.2 | 0.008 | 0.08 | 0.8 |
| 3913 |  | 44.9 |  | 0.07 | 4.1 | < .001 | 0.13 | 1.58 |
| 3914 |  | 38.7 |  | 0.04 | 4 | 0.002 | 0.09 | 1.12 |
| 3915 |  | 39.9 |  | 0.07 | 4.5 | 0.007 | 0.12 | 1.32 |
| 3917 |  | 40.5 |  | 0.06 | 4 | < .001 | 0.14 | 1.36 |
| 3918 |  | 34.6 |  | 0.07 | 4 | 0.008 | 0.14 | 1.11 |
| 3919 |  | 38.6 |  | 0.08 | 3.8 | < .001 | 0.14 | 1.23 |
| 3920 |  | 36 |  | 0.08 | 4 | 0.002 | 0.12 | 1.17 |
| 3921 |  | 41.8 |  | 0.07 | 5.1 | 0.009 | 0.05 | 0.76 |
| 3922 |  | 43.1 |  | 0.05 | 5.3 | 0.012 | 0.05 | 0.78 |
| 3923 |  | 41.6 |  | 0.05 | 5 | 0.005 | 0.05 | 0.74 |
| 3924 |  | 40.1 |  | 0.06 | 5 | 0.004 | 0.06 | 0.72 |
| 3925 |  | 52.9 |  | 0.04 | 4.6 | 0.008 | 0.06 | 0.79 |
| 3926 |  | 42.1 |  | 0.06 | 5 | 0.002 | 0.08 | 0.72 |
| 3927 |  | 27 |  | 0.04 | 4 | 0.017 | 0.05 | 0.49 |
| 3928 |  | 30.4 |  | 0.06 | 4.8 | 0.01 | 0.07 | 0.57 |
| 3929 |  | 35.1 |  | 0.03 | 4.6 | 0.01 | 0.08 | 0.52 |
| 3930 |  | 237 |  | 0.04 | 2.2 | 0.009 | 0.03 | 0.38 |

*Analysis: GROUP 1EX - 0.25 GM*

| **Element** | V | W | Y | Zn | Zr | Ag | Al | As |
|---|---|---|---|---|---|---|---|---|
| **LDL** | 2 | 0.1 | 0.01 | 0.1 | 0.1 | 0.1 | 0.01 | 1 |
| **Samples** | ppm | ppm | ppm | ppm | ppm | ppm | % | ppm |
| **3875** | 28 | <.1 |  | 113.3 |  |  |  |  |
| **3876** | 29 | <.1 |  | 87.6 |  |  |  |  |
| **3877** | 25 | <.1 |  | 100.9 |  |  |  |  |
| **3878** | 30 | <.1 |  | 117.6 |  |  |  |  |
| **3879** | 29 | <.1 |  | 113.7 |  |  |  |  |
| **3880** | 33 | <.1 |  | 119 |  |  |  |  |
| **3882** | 33 | <.1 |  | 131.6 |  |  |  |  |
| **3884** | 31 | <.1 |  | 123.8 |  |  |  |  |
| **3885** | 35 | <.1 |  | 141.5 |  |  |  |  |
| **3886** | 28 | <.1 |  | 119.2 |  |  |  |  |
| **3887** | 29 | <.1 |  | 118.3 |  |  |  |  |
| **3888** | 32 | <.1 |  | 122 |  |  |  |  |
| **3889** | 31 | <.1 |  | 122.1 |  |  |  |  |
| **3890** | 30 | <.1 |  | 120.8 |  |  |  |  |
| **3891** | 48 | <.1 |  | 167.8 |  |  |  |  |
| **3894** | 42 | <.1 |  | 150.7 |  |  |  |  |
| **3895** | 35 | <.1 |  | 139.5 |  |  |  |  |
| **3896** | 37 | <.1 |  | 134.4 |  |  |  |  |
| **3897** | 38 | <.1 |  | 180.2 |  |  |  |  |
| **3898** | 29 | <.1 |  | 115.5 |  |  |  |  |
| **3899** | 36 | <.1 |  | 115.7 |  |  |  |  |
| **3900** | 29 | <.1 |  | 132 |  |  |  |  |
| **3901** | 32 | <.1 |  | 137.9 |  |  |  |  |
| **3907** | 27 | <.1 |  | 119.8 |  |  |  |  |
| **3909** | 50 | <.1 |  | 125.8 |  |  |  |  |
| **3910** | 29 | <.1 |  | 115.1 |  |  |  |  |
| **3911** | 28 | <.1 |  | 157.7 |  |  |  |  |
| **3912** | 31 | <.1 |  | 118.4 |  |  |  |  |
| **3913** | 26 | <.1 |  | 111.5 |  |  |  |  |
| **3914** | 29 | <.1 |  | 101.6 |  |  |  |  |
| **3915** | 29 | <.1 |  | 111.5 |  |  |  |  |
| **3917** | 29 | <.1 |  | 97.8 |  |  |  |  |
| **3918** | 27 | <.1 |  | 105.2 |  |  |  |  |
| **3919** | 29 | <.1 |  | 106.4 |  |  |  |  |
| **3920** | 28 | <.1 |  | 120.8 |  |  |  |  |
| **3921** | 31 | <.1 |  | 108.1 |  |  |  |  |
| **3922** | 33 | <.1 |  | 103.9 |  |  |  |  |
| **3923** | 31 | <.1 |  | 98.6 |  |  |  |  |
| **3924** | 34 | <.1 |  | 102.1 |  |  |  |  |
| **3925** | 36 | <.1 |  | 74.7 |  |  |  |  |
| **3926** | 29 | <.1 |  | 98.4 |  |  |  |  |
| **3927** | 18 | <.1 |  | 60.8 |  |  |  |  |
| **3928** | 23 | <.1 |  | 72.9 |  |  |  |  |
| **3929** | 23 | <.1 |  | 75.6 |  |  |  |  |
| **3930** | 19 | <.1 |  | 30.6 |  |  |  |  |

| **Samples** | **Hole** | **Latitude** | **Longitude** | **From (m)** | **To (m)** | **Analysis Date** |
|---|---|---|---|---|---|---|
| **3932** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 745.475 | 745.545 | Dec. 2003 |
| **3933** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 746.450 | 746.500 | Dec. 2003 |
| **3934** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 747.440 | 747.490 | Dec. 2003 |
| **3935** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 748.455 | 748.525 | Dec. 2003 |
| **3936** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 749.450 | 749.500 | Dec. 2003 |
| **3937** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 750.425 | 750.495 | Dec. 2003 |
| **3938** | 00/16-22-075-08W6/0 | 55.518915 | -119.13755 | 750.745 | 751.615 | Dec. 2003 |
| **3939** | 00/10-36-060-22W4/0 | 54.234284 | -113.156881 | 489.955 | 490.025 | Dec. 2003 |
| **3940** | 00/10-36-060-22W4/0 | 54.234284 | -113.156881 | 490.960 | 491.020 | Dec. 2003 |
| **3941** | 00/10-36-060-22W4/0 | 54.234284 | -113.156881 | 491.925 | 491.980 | Dec. 2003 |
| **3942** | 00/10-36-060-22W4/0 | 54.234284 | -113.156881 | 492.910 | 492.975 | Dec. 2003 |
| **3943** | 00/10-36-060-22W4/0 | 54.234284 | -113.156881 | 493.995 | 494.065 | Dec. 2003 |
| **3944** | 00/10-36-060-22W4/0 | 54.234284 | -113.156881 | 494.945 | 495.015 | Dec. 2003 |
| **3945** | 00/10-36-060-22W4/0 | 54.234284 | -113.156881 | 495.985 | 496.030 | Dec. 2003 |
| **3946** | 00/10-36-060-22W4/0 | 54.234284 | -113.156881 | 496.955 | 497.025 | Dec. 2003 |
| **3947** | 00/10-36-060-22W4/0 | 54.234284 | -113.156881 | 497.940 | 498.000 | Dec. 2003 |
| **3949** | 00/06-35-059-21W4/0 | 54.142405 | -113.040407 | 457.500 | 457.560 | Dec. 2003 |
| **3950** | 00/06-35-059-21W4/0 | 54.142405 | -113.040407 | 458.485 | 458.555 | Dec. 2003 |
| **3951** | 00/06-35-059-21W4/0 | 54.142405 | -113.040407 | 459.515 | 459.585 | Dec. 2003 |
| **3952** | 00/06-35-059-21W4/0 | 54.142405 | -113.040407 | 460.500 | 460.555 | Dec. 2003 |
| **3953** | 00/06-35-059-21W4/0 | 54.142405 | -113.040407 | 461.490 | 461.560 | Dec. 2003 |
| **3954** | 00/06-35-059-21W4/0 | 54.142405 | -113.040407 | 462.540 | 462.595 | Dec. 2003 |
| **3955** | 00/06-35-059-21W4/0 | 54.142405 | -113.040407 | 463.530 | 463.600 | Dec. 2003 |
| **3956** | 00/06-35-059-21W4/0 | 54.142405 | -113.040407 | 464.480 | 464.550 | Dec. 2003 |
| **3957** | 00/06-35-059-21W4/0 | 54.142405 | -113.040407 | 465.490 | 465.560 | Dec. 2003 |
| **3958** | 00/06-35-059-21W4/0 | 54.142405 | -113.040407 | 464.960 | 465.020 | Dec. 2003 |
| **3959** | 00/06-35-059-21W4/0 | 54.142405 | -113.040407 | 466.010 | 466.080 | Dec. 2003 |
| **3960** | 00/06-35-059-21W4/0 | 54.142405 | -113.040407 | 466.995 | 467.065 | Dec. 2003 |
| **3962** | 00/06-35-059-21W4/0 | 54.142405 | -113.040407 | 467.900 | 467.970 | Dec. 2003 |
| **3963** | 00/06-35-059-21W4/0 | 54.142405 | -113.040407 | 468.975 | 469.045 | Dec. 2003 |
| **3966** | 00/06-35-059-21W4/0 | 54.142405 | -113.040407 | 469.935 | 470.005 | Dec. 2003 |
| **3969** | 00/06-11-061-22W4/0 | 54.259019 | -113.192286 | 500.975 | 501.035 | Dec. 2003 |
| **3970** | 00/06-11-061-22W4/0 | 54.259019 | -113.192286 | 501.920 | 501.990 | Dec. 2003 |
| **3971** | 00/06-11-061-22W4/0 | 54.259019 | -113.192286 | 502.940 | 503.010 | Dec. 2003 |
| **3972** | 00/06-11-061-22W4/0 | 54.259019 | -113.192286 | 503.910 | 503.980 | Dec. 2003 |
| **3973** | 00/06-11-061-22W4/0 | 54.259019 | -113.192286 | 504.850 | 504.920 | Dec. 2003 |
| **3974** | 00/06-11-061-22W4/0 | 54.259019 | -113.192286 | 505.900 | 505.970 | Dec. 2003 |
| **3975** | 00/06-11-061-22W4/0 | 54.259019 | -113.192286 | 506.885 | 506.955 | Dec. 2003 |
| **3977** | 00/06-11-061-22W4/0 | 54.259019 | -113.192286 | 507.940 | 508.000 | Dec. 2003 |
| **3978** | 00/06-11-061-22W4/0 | 54.259019 | -113.192286 | 508.920 | 508.990 | Dec. 2003 |
| **3980** | 00/06-11-061-22W4/0 | 54.259019 | -113.192286 | 509.985 | 510.050 | Dec. 2003 |
| **3981** | 00/06-11-061-22W4/0 | 54.259019 | -113.192286 | 511.010 | 511.080 | Dec. 2003 |
| **3982** | 00/06-11-061-22W4/0 | 54.259019 | -113.192286 | 512.010 | 512.080 | Dec. 2003 |
| **3984** | 00/06-31-046-08W5/0 | 53.008381 | -115.152694 | 1819.090 | 1819.140 | Dec. 2003 |
| **4523** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2371.830 | 2371.900 | Dec. 2003 |
| **4525** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2371.810 | 2371.880 | Dec. 2003 |
| **4527** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2373.805 | 2373.875 | Dec. 2003 |
| **4528** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2374.835 | 2374.905 | Dec. 2003 |
| **4529** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2375.820 | 2375.890 | Dec. 2003 |

| **Samples** | **Probability of Fm** | **Formation** | **Sample Description** |
|---|---|---|---|
| **3932** | Unknown | Not SWS (Below FS?) | Oil stained sands, light brown in colour |
| **3933** | Unknown | Not SWS (Below FS?) | Mud with sand lams, abundant micas |
| **3934** | Unknown | Not SWS (Below FS?) | Laminated , abundant micas, calc. organic fragments |
| **3935** | Unknown | Not SWS (Below FS?) | Bioturbated sand/shale, some micas |
| **3936** | Unknown | Not SWS (Below FS?) | Sand with abundant silt, a light brown colour |
| **3937** | Unknown | Not SWS (Below FS?) | Sand/shale in ruble form, silty |
| **3938** | Unknown | Not SWS (Below FS?) | Bioturbated sand/shale |
| **3939** | Possible | Top SWS/Base Carlile | Dk grey shale, some silty lams |
| **3940** | Possible | Top SWS/Base Carlile | Dk grey shale, silty lams |
| **3941** | Possible | Top SWS/Base Carlile | Dk grey shale with sand lams |
| **3942** | Possible | Top SWS/Base Carlile | Sand/ dk grey shale lams |
| **3943** | Possible | Top SWS/Base Carlile | Sand with dk grey shale lams, some bioturbation |
| **3944** | Possible | Top SWS/Base Carlile | Sand with dk grey shale lams, some bioturbation |
| **3945** | Possible | Top SWS/Base Carlile | Sand with dk grey shale lams |
| **3946** | Possible | Top SWS/Base Carlile | Dk grey shale with sandy lams |
| **3947** | Possible | Top SWS/Base Carlile | Dk grey shale with some sandy lams/ripples |
| **3949** | Possible | Carlile (or overlying shale) | Dk grey shale, silty lams/pockets |
| **3950** | Possible | Carlile (or overlying shale) | Dk grey shale, silty |
| **3951** | Possible | Carlile (or overlying shale) | Dk grey shale, silty lams |
| **3952** | Possible | Carlile (or overlying shale) | Dk grey shale, silt lams |
| **3953** | Possible | Carlile (or overlying shale) | Dk grey shale, silty lams/pockets |
| **3954** | Possible | Carlile (or overlying shale) | Dk grey shale, silty lams/pockets |
| **3955** | Possible | SWS (straddles the Carlile border) | Dk grey shale, silty lams |
| **3956** | Possible | SWS (straddles the Carlile border) | Dk grey shale with sand lams, some micas |
| **3957** | Possible | SWS (straddles the Carlile border) | Dk grey shale with sand lams/pockets, some shell fragments |
| **3958** | Possible | SWS (straddles the Carlile border) | Bioturbated sand/shale, black organic fragments, silt lams within a sandy bed as well |
| **3959** | Possible | SWS (straddles the Carlile border) | Dk grey shale with sand lams, some silt, micas |
| **3960** | Possible | SWS (straddles the Carlile border) | Dk grey shale with sand lams/pockets |
| **3962** | Possible | SWS (straddles the Carlile border) | Med grey calcareous shale, some silt |
| **3963** | Possible | SWS (straddles the Carlile border) | Dk grey calcareous shale, silty, micas, some organic remains |
| **3966** | Possible | SWS (straddles the Carlile border) | Calcareous shale/sand lams, some silt |
| **3969** | Possible | Top of SWS | Dk grey shale, silty laminations |
| **3970** | Possible | Top of SWS | Dk grey shale, some silt, some dk organic matter |
| **3971** | Possible | Top of SWS | Dk grey shale, some silt |
| **3972** | Possible | Top of SWS | Dk grey shale, some silty pockets |
| **3973** | Possible | Top of SWS | Dk grey shale, silty, a little black organic debris |
| **3974** | Possible | Top of SWS | Dk grey shale, some silty pockets |
| **3975** | Possible | Top of SWS | Dk grey shale with sand lams |
| **3977** | Possible | Top of SWS | Dk grey shale with sand lams, a little bioturbation |
| **3978** | Possible | Top of SWS | Dk grey shale with sand lams, some bioturbation |
| **3980** | Possible | Base of Carlile? | Sand/shale bioturbated lams (calcareous)-micropaleo |
| **3981** | Possible | Base of Carlile? | Sand with dk grey shale lams - bioturbated |
| **3982** | Possible | Base of Carlile? | Dk grey shale with some sandy lams/ripples |
| **3984** | Unknown | Second White Specks | Calcareous black shale - micropaleo? |
| **4523** | Unknown | Second White Specks | Dk grey shale, sandy/silty lams/ripples filled with pyrite, some shelly debris |
| **4525** | Unknown | Second White Specks | Dk grey shale, some silt, some shelly remains |
| **4527** | Unknown | Second White Specks | Dk grey shale, silty, some shelly fragments |
| **4528** | Unknown | Second White Specks | Dk grey shale in broken fragments, some silt |
| **4529** | Unknown | Second White Specks | Dk grey shale, wisps of silt |

***Analysis: GROUP 1F1 - 1.00 GM***

| **Element** | **Ag** | **Al** | **As** | **Au** | **B** | **Ba** | **Be** | **Bi** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** | **0.1** | **0.02** |
| **Samples** | **ppb** | **%** | **ppm** | **ppb** | **ppm** | **ppm** | **ppm** | **ppm** |
| **3932** | 89 | 0.22 | 9.2 | 0.2 | 5 | 89.9 | | 0.06 |
| **3933** | 166 | 1.55 | 90.4 | 1.1 | 16 | 431.2 | | 0.34 |
| **3934** | 107 | 0.46 | 19.6 | 0.6 | 7 | 168 | | 0.1 |
| **3935** | 106 | 0.58 | 11.9 | 0.7 | 11 | 231.9 | | 0.13 |
| **3936** | 42 | 0.27 | 3.5 | < .2 | 4 | 172.2 | | 0.04 |
| **3937** | 87 | 0.71 | 9.9 | 0.3 | 9 | 250.2 | | 0.12 |
| **3938** | 87 | 0.67 | 10.8 | 0.5 | 8 | 263.6 | | 0.13 |
| **3939** | 336 | 0.92 | 25.7 | 1.5 | 15 | 52.2 | | 0.4 |
| **3940** | 369 | 0.92 | 28.2 | 1.2 | 21 | 55.2 | | 0.46 |
| **3941** | 312 | 0.86 | 25.8 | 0.9 | 20 | 70 | | 0.35 |
| **3942** | 253 | 0.71 | 22.5 | 0.7 | 22 | 151.1 | | 0.17 |
| **3943** | 193 | 0.37 | 15.5 | 0.9 | 13 | 268.6 | | 0.07 |
| **3944** | 197 | 0.33 | 14.8 | 0.9 | 14 | 196.3 | | 0.08 |
| **3945** | 202 | 0.38 | 12.6 | 0.4 | 14 | 103.7 | | 0.08 |
| **3946** | 399 | 0.68 | 32.5 | 1.6 | 16 | 62 | | 0.33 |
| **3947** | 384 | 0.74 | 37.9 | 3.2 | 20 | 66.2 | | 0.43 |
| **3949** | 251 | 0.96 | 14.2 | 1.2 | 20 | 156 | | 0.38 |
| **3950** | 304 | 0.8 | 21.9 | 1.5 | 19 | 61.2 | | 0.31 |
| **3951** | 314 | 0.85 | 23 | 0.9 | 19 | 78.1 | | 0.39 |
| **3952** | 318 | 0.76 | 27.3 | 1.3 | 19 | 63.2 | | 0.35 |
| **3953** | 361 | 0.79 | 29 | 1.2 | 19 | 67.6 | | 0.4 |
| **3954** | 313 | 0.82 | 24.9 | 1.5 | 19 | 81.8 | | 0.41 |
| **3955** | 356 | 0.81 | 28.1 | 0.7 | 17 | 55.6 | | 0.4 |
| **3956** | 341 | 0.78 | 29.5 | 1.3 | 19 | 58.6 | | 0.35 |
| **3957** | 378 | 0.81 | 43.5 | 2.3 | 20 | 58 | | 0.39 |
| **3958** | 144 | 0.28 | 8.9 | 1.1 | 9 | 134.7 | | 0.06 |
| **3959** | 380 | 0.6 | 36.3 | 0.7 | 20 | 66.8 | | 0.28 |
| **3960** | 330 | 0.58 | 25.6 | 1.3 | 18 | 97 | | 0.25 |
| **3962** | 311 | 0.66 | 23.6 | 0.9 | 21 | 102.1 | | 0.26 |
| **3963** | 310 | 0.56 | 24.9 | 1.4 | 18 | 113.1 | | 0.23 |
| **3966** | 364 | 0.72 | 24.1 | 1.1 | 19 | 128.8 | | 0.28 |
| **3969** | 311 | 0.88 | 30.6 | 0.8 | 21 | 58.1 | | 0.36 |
| **3970** | 289 | 0.99 | 21.9 | 0.3 | 19 | 68.3 | | 0.42 |
| **3971** | 269 | 0.94 | 15.9 | 0.3 | 19 | 115.9 | | 0.42 |
| **3972** | 313 | 0.93 | 27.1 | 0.8 | 20 | 59.7 | | 0.39 |
| **3973** | 344 | 0.86 | 25.8 | 0.6 | 18 | 63.8 | | 0.4 |
| **3974** | 350 | 0.84 | 30.3 | 1.4 | 20 | 69.4 | | 0.39 |
| **3975** | 300 | 0.67 | 27.5 | 0.6 | 19 | 87.8 | | 0.34 |
| **3977** | 202 | 0.55 | 18.7 | < .2 | 20 | 150.1 | | 0.15 |
| **3978** | 315 | 0.58 | 28.3 | 0.7 | 19 | 100.4 | | 0.25 |
| **3980** | 174 | 0.34 | 12.4 | 0.2 | 13 | 221.3 | | 0.07 |
| **3981** | 175 | 0.34 | 11.2 | < .2 | 13 | 174.4 | | 0.07 |
| **3982** | 339 | 0.69 | 28.4 | 0.9 | 17 | 82.2 | | 0.32 |
| **3984** | 310 | 0.83 | 32.5 | < .2 | 10 | 53.5 | | 0.26 |
| **4523** | 317 | 0.59 | 42.6 | < .2 | 9 | 36.6 | | 0.26 |
| **4525** | 339 | 0.46 | 37 | < .2 | 9 | 45.7 | | 0.24 |
| **4527** | 162 | 0.31 | 18.5 | 0.3 | 5 | 165.2 | | 0.14 |
| **4528** | 261 | 0.57 | 33.7 | 0.7 | 6 | 46.8 | | 0.25 |
| **4529** | 269 | 0.68 | 36 | 0.4 | 7 | 44.6 | | 0.33 |

| **Element** | **Ca** | **Cd** | **Ce** | **Co** | **Cr** | **Cs** | **Cu** | **Fe** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **0.01** | **0.1** | **0.1** | **0.5** | **0.02** | **0.01** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **3932** | 0.3 | 0.02 | | 8.9 | 7 | | 22.81 | 2.49 |
| **3933** | 0.21 | 0.05 | | 23.9 | 27.9 | | 26.81 | 2.54 |
| **3934** | 0.12 | 0.05 | | 8.9 | 10.2 | | 5.22 | 1.05 |
| **3935** | 0.13 | 0.03 | | 9.3 | 14.1 | | 10.48 | 0.94 |
| **3936** | 0.21 | 0.03 | | 2.2 | 6.8 | | 3.44 | 0.48 |
| **3937** | 0.14 | 0.05 | | 7.3 | 14.6 | | 10.27 | 1.32 |
| **3938** | 0.14 | 0.04 | | 8.3 | 14.3 | | 11.21 | 1.23 |
| **3939** | 0.68 | 0.74 | | 11.4 | 20 | | 51.86 | 2.57 |
| **3940** | 0.64 | 0.82 | | 12.8 | 20.1 | | 54.48 | 2.59 |
| **3941** | 1.24 | 0.63 | | 9.6 | 20.8 | | 42.4 | 2.21 |
| **3942** | 4.33 | 0.64 | | 6.2 | 19.8 | | 23.37 | 1.71 |
| **3943** | 6.41 | 0.42 | | 3.3 | 12 | | 10.44 | 1.46 |
| **3944** | 4.69 | 0.43 | | 3.7 | 11.2 | | 11.68 | 1.14 |
| **3945** | 2.66 | 0.42 | | 3.7 | 12.6 | | 11.34 | 1.04 |
| **3946** | 0.87 | 1 | | 10.3 | 16.7 | | 43.27 | 2.38 |
| **3947** | 1.66 | 0.9 | | 11.2 | 16.6 | | 48.12 | 2.45 |
| **3949** | 0.46 | 0.27 | | 7.1 | 19.2 | | 49.27 | 1.76 |
| **3950** | 1.56 | 0.62 | | 8.8 | 17 | | 40.98 | 2.58 |
| **3951** | 0.79 | 0.51 | | 10.5 | 17.5 | | 48.8 | 2.27 |
| **3952** | 0.99 | 0.71 | | 9.2 | 17 | | 43.8 | 2.57 |
| **3953** | 0.85 | 0.8 | | 10.8 | 17.6 | | 52.08 | 2.7 |
| **3954** | 0.97 | 0.68 | | 11.9 | 17.6 | | 48.87 | 2.53 |
| **3955** | 0.87 | 0.71 | | 11.4 | 18.6 | | 54.54 | 2.46 |
| **3956** | 1.49 | 0.72 | | 10.6 | 19 | | 47.19 | 2.59 |
| **3957** | 1.08 | 0.84 | | 11.4 | 21.1 | | 53.2 | 2.55 |
| **3958** | 7.81 | 0.3 | | 2.7 | 10.2 | | 10.22 | 1.41 |
| **3959** | 2.11 | 1.41 | | 13.3 | 16.8 | | 42.1 | 2.53 |
| **3960** | 3.23 | 1.28 | | 10.6 | 17.9 | | 35.71 | 2.2 |
| **3962** | 3.9 | 1.52 | | 10 | 18.5 | | 35.83 | 2.18 |
| **3963** | 5.54 | 1.21 | | 10.7 | 17.1 | | 34.4 | 2.27 |
| **3966** | 3.27 | 1.33 | | 9.8 | 20.7 | | 41.37 | 1.83 |
| **3969** | 1.57 | 0.52 | | 10.4 | 18.7 | | 44.57 | 2.82 |
| **3970** | 0.6 | 0.46 | | 11.3 | 19.7 | | 47.97 | 2.45 |
| **3971** | 0.37 | 0.33 | | 9.6 | 18.6 | | 50.66 | 1.98 |
| **3972** | 0.9 | 0.7 | | 10 | 18.4 | | 47.5 | 2.65 |
| **3973** | 0.66 | 0.65 | | 11.3 | 18.2 | | 53.19 | 2.53 |
| **3974** | 0.77 | 0.66 | | 11.4 | 17.6 | | 51.27 | 2.48 |
| **3975** | 1.06 | 0.56 | | 9.6 | 16.8 | | 39.86 | 2.18 |
| **3977** | 4.46 | 0.54 | | 4.7 | 15.5 | | 18.19 | 1.63 |
| **3978** | 1.77 | 0.59 | | 8.8 | 16.8 | | 33.58 | 2 |
| **3980** | 7.36 | 0.4 | | 3.4 | 12.6 | | 9.88 | 1.56 |
| **3981** | 4.34 | 0.41 | | 3.3 | 12.1 | | 9.79 | 1.06 |
| **3982** | 1.06 | 0.75 | | 9.7 | 16.5 | | 41.05 | 2.07 |
| **3984** | 3.18 | 0.76 | | 13.8 | 14 | | 37.26 | 2.55 |
| **4523** | 5.27 | 1.4 | | 15.4 | 10.4 | | 37.08 | 3.34 |
| **4525** | 6.56 | 1.44 | | 17.6 | 9.1 | | 37.24 | 2.9 |
| **4527** | 12.72 | 0.62 | | 9.7 | 12.2 | | 20.41 | 3.35 |
| **4528** | 5.09 | 1 | | 16 | 10.5 | | 34.7 | 3.08 |
| **4529** | 4.26 | 0.98 | | 16.2 | 12.1 | | 35.46 | 3.21 |

| **Element** | **Ga** | **Ge** | **Hf** | **Hg** | **In** | **K** | **La** | **Li** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **0.02** | **5** | **0.02** | **0.01** | **0.5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppb** | **ppm** | **%** | **ppm** | **ppm** |
| **3932** | 1.2 | | | 39 | | 0.07 | 4.3 | |
| **3933** | 6 | | | 79 | | 0.43 | 9.6 | |
| **3934** | 3.2 | | | 71 | | 0.19 | 7.5 | |
| **3935** | 4.1 | | | 46 | | 0.22 | 5.6 | |
| **3936** | 1.6 | | | 50 | | 0.11 | 4.1 | |
| **3937** | 3 | | | 40 | | 0.22 | 6.1 | |
| **3938** | 2.7 | | | 43 | | 0.2 | 5.7 | |
| **3939** | 4 | | | 149 | | 0.28 | 9.2 | |
| **3940** | 4.7 | | | 148 | | 0.27 | 9.6 | |
| **3941** | 5.4 | | | 78 | | 0.26 | 16.6 | |
| **3942** | 3.7 | | | 89 | | 0.21 | 40 | |
| **3943** | 1.9 | | | 143 | | 0.13 | 18.9 | |
| **3944** | 2 | | | 270 | | 0.13 | 14.8 | |
| **3945** | 2 | | | 86 | | 0.14 | 12.6 | |
| **3946** | 5 | | | 95 | | 0.2 | 11.6 | |
| **3947** | 4.2 | | | 136 | | 0.22 | 9.5 | |
| **3949** | 3.8 | | | 97 | | 0.25 | 10.4 | |
| **3950** | 3.4 | | | 127 | | 0.22 | 9.7 | |
| **3951** | 3.7 | | | 889 | | 0.23 | 10.3 | |
| **3952** | 3.6 | | | 398 | | 0.21 | 9.8 | |
| **3953** | 4 | | | 151 | | 0.22 | 9.5 | |
| **3954** | 4 | | | 154 | | 0.22 | 10.1 | |
| **3955** | 4.1 | | | 219 | | 0.22 | 9.7 | |
| **3956** | 3.9 | | | 467 | | 0.21 | 15 | |
| **3957** | 4.7 | | | 241 | | 0.23 | 15.4 | |
| **3958** | 1.5 | | | 124 | | 0.1 | 7.1 | |
| **3959** | 4 | | | 476 | | 0.19 | 9.6 | |
| **3960** | 3.5 | | | 276 | | 0.18 | 8.8 | |
| **3962** | 3.8 | | | 280 | | 0.2 | 9.1 | |
| **3963** | 3.1 | | | 192 | | 0.18 | 7.5 | |
| **3966** | 4.7 | | | 322 | | 0.22 | 12.4 | |
| **3969** | 3.8 | | | 158 | | 0.24 | 11.6 | |
| **3970** | 4 | | | 110 | | 0.27 | 9.9 | |
| **3971** | 3.9 | | | 108 | | 0.25 | 10 | |
| **3972** | 4 | | | 134 | | 0.26 | 11.5 | |
| **3973** | 3.9 | | | 99 | | 0.24 | 9.3 | |
| **3974** | 4.2 | | | 107 | | 0.25 | 9.6 | |
| **3975** | 4.2 | | | 147 | | 0.21 | 8.4 | |
| **3977** | 2.8 | | | 64 | | 0.17 | 25.9 | |
| **3978** | 3.9 | | | 101 | | 0.2 | 14.9 | |
| **3980** | 1.9 | | | 45 | | 0.12 | 13.8 | |
| **3981** | 1.9 | | | 59 | | 0.12 | 11.7 | |
| **3982** | 4.7 | | | 119 | | 0.22 | 11.5 | |
| **3984** | 2.6 | | | 86 | | 0.23 | 4 | |
| **4523** | 1.8 | | | 100 | | 0.19 | 3.8 | |
| **4525** | 1.5 | | | 78 | | 0.18 | 3.8 | |
| **4527** | 0.9 | | | 52 | | 0.13 | 3.2 | |
| **4528** | 1.7 | | | 91 | | 0.19 | 3.6 | |
| **4529** | 2 | | | 90 | | 0.21 | 3.6 | |

| **Element** | **Mg** | **Mn** | **Mo** | **Na** | **Nb** | **Ni** | **P** | **Pb** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **1** | **0.01** | **0.001** | **0.02** | **0.1** | **0.001** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** |
| **3932** | 0.21 | 142 | 0.47 | 0.053 | | 4.5 | 0.037 | 10.44 |
| **3933** | 0.39 | 131 | 0.69 | 0.272 | | 39.3 | 0.074 | 19.41 |
| **3934** | 0.13 | 54 | 0.46 | 0.083 | | 11.2 | 0.048 | 16.56 |
| **3935** | 0.15 | 44 | 0.37 | 0.116 | | 13.4 | 0.053 | 16.34 |
| **3936** | 0.08 | 33 | 0.11 | 0.057 | | 3.9 | 0.039 | 9.9 |
| **3937** | 0.19 | 52 | 0.18 | 0.136 | | 13.6 | 0.06 | 14.07 |
| **3938** | 0.18 | 44 | 0.15 | 0.133 | | 15 | 0.057 | 9.27 |
| **3939** | 0.41 | 63 | 11.16 | 0.279 | | 43.9 | 0.064 | 18.39 |
| **3940** | 0.43 | 79 | 13 | 0.279 | | 47.5 | 0.068 | 18.94 |
| **3941** | 0.64 | 78 | 10.07 | 0.222 | | 37.7 | 0.149 | 16.41 |
| **3942** | 1.6 | 108 | 6.76 | 0.134 | | 23 | 0.408 | 9.57 |
| **3943** | 2.74 | 148 | 4.25 | 0.098 | | 12.3 | 0.231 | 4.96 |
| **3944** | 1.78 | 103 | 4.13 | 0.116 | | 13.6 | 0.154 | 5.66 |
| **3945** | 1.23 | 74 | 3.39 | 0.127 | | 12.7 | 0.119 | 5.55 |
| **3946** | 0.54 | 69 | 11.52 | 0.214 | | 40.2 | 0.076 | 15.77 |
| **3947** | 0.52 | 65 | 12.62 | 0.24 | | 42.1 | 0.074 | 17.63 |
| **3949** | 0.44 | 60 | 1.46 | 0.289 | | 33.1 | 0.061 | 18.17 |
| **3950** | 0.57 | 96 | 4.02 | 0.235 | | 33 | 0.075 | 16.31 |
| **3951** | 0.41 | 79 | 6.13 | 0.275 | | 37.7 | 0.071 | 17.59 |
| **3952** | 0.5 | 77 | 11.44 | 0.262 | | 37.9 | 0.073 | 16.79 |
| **3953** | 0.4 | 69 | 12.94 | 0.265 | | 42.5 | 0.063 | 18.28 |
| **3954** | 0.39 | 76 | 10.48 | 0.283 | | 42.7 | 0.066 | 18.38 |
| **3955** | 0.41 | 69 | 11.15 | 0.277 | | 44.9 | 0.066 | 18.55 |
| **3956** | 0.54 | 65 | 12.42 | 0.247 | | 40.6 | 0.12 | 16.57 |
| **3957** | 0.49 | 72 | 12.54 | 0.247 | | 44.4 | 0.124 | 17.93 |
| **3958** | 3.56 | 174 | 1.92 | 0.087 | | 11 | 0.086 | 3.92 |
| **3959** | 0.67 | 80 | 17.02 | 0.193 | | 45.5 | 0.08 | 12.97 |
| **3960** | 0.69 | 68 | 14.18 | 0.229 | | 49.2 | 0.075 | 13.07 |
| **3962** | 0.68 | 67 | 13.33 | 0.24 | | 49.2 | 0.076 | 13.19 |
| **3963** | 0.96 | 93 | 16.26 | 0.212 | | 50.5 | 0.074 | 12.17 |
| **3966** | 0.64 | 61 | 11.27 | 0.262 | | 48 | 0.075 | 14.18 |
| **3969** | 0.57 | 113 | 8.25 | 0.281 | | 38.1 | 0.105 | 17.83 |
| **3970** | 0.4 | 72 | 7.76 | 0.287 | | 42 | 0.067 | 19.3 |
| **3971** | 0.36 | 53 | 5.25 | 0.299 | | 39.5 | 0.059 | 18.79 |
| **3972** | 0.45 | 72 | 10.97 | 0.273 | | 42.6 | 0.104 | 18.89 |
| **3973** | 0.42 | 69 | 10.46 | 0.278 | | 45 | 0.062 | 19.1 |
| **3974** | 0.47 | 77 | 10.97 | 0.259 | | 43.1 | 0.066 | 18.33 |
| **3975** | 0.65 | 76 | 9.4 | 0.218 | | 37 | 0.072 | 15.64 |
| **3977** | 1.75 | 127 | 5.07 | 0.134 | | 17.8 | 0.263 | 8.01 |
| **3978** | 0.92 | 75 | 8.23 | 0.21 | | 32.5 | 0.121 | 13.1 |
| **3980** | 3.22 | 182 | 3.8 | 0.117 | | 13.2 | 0.177 | 4.53 |
| **3981** | 1.86 | 99 | 3.85 | 0.111 | | 11.4 | 0.157 | 4.33 |
| **3982** | 0.63 | 68 | 8.79 | 0.229 | | 36.6 | 0.084 | 14.2 |
| **3984** | 0.45 | 84 | 10.95 | 0.221 | | 48 | 0.075 | 15.86 |
| **4523** | 0.56 | 72 | 20.92 | 0.149 | | 50.8 | 0.091 | 15.39 |
| **4525** | 0.37 | 66 | 19.05 | 0.145 | | 64.6 | 0.07 | 14.06 |
| **4527** | 4.33 | 234 | 9.01 | 0.092 | | 32.8 | 0.043 | 8.01 |
| **4528** | 0.49 | 84 | 11.97 | 0.163 | | 56.8 | 0.072 | 15.13 |
| **4529** | 0.56 | 86 | 12.18 | 0.178 | | 63.4 | 0.075 | 16.99 |

| **Element** | **Pd** | **Pt** | **Rb** | **Re** | **S** | **Sb** | **Sc** | **Se** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **10** | **2** | **0.1** | **1** | **0.02** | **0.02** | **0.1** | **0.1** |
| **Samples** | **ppb** | **ppb** | **ppm** | **ppb** | **%** | **ppm** | **ppm** | **ppm** |
| **3932** | | | | | 0.07 | 0.1 | 1.7 | 0.2 |
| **3933** | | | | | 0.53 | 0.2 | 4.4 | 0.4 |
| **3934** | | | | | 0.09 | 0.16 | 2 | 0.2 |
| **3935** | | | | | 0.11 | 0.13 | 1.8 | 0.3 |
| **3936** | | | | | 0.03 | 0.07 | 0.9 | 0.2 |
| **3937** | | | | | 0.18 | 0.11 | 2.5 | 0.2 |
| **3938** | | | | | 0.21 | 0.11 | 2.5 | 0.2 |
| **3939** | | | | | 2.53 | 0.37 | 4.2 | 3.2 |
| **3940** | | | | | 2.65 | 0.39 | 4.2 | 3.7 |
| **3941** | | | | | 2.18 | 0.43 | 3.2 | 2.8 |
| **3942** | | | | | 1.34 | 0.45 | 6 | 1.9 |
| **3943** | | | | | 0.73 | 0.35 | 3.1 | 1.1 |
| **3944** | | | | | 0.75 | 0.42 | 2.6 | 1.3 |
| **3945** | | | | | 0.79 | 0.37 | 2.5 | 1 |
| **3946** | | | | | 2.46 | 0.5 | 3.4 | 3.1 |
| **3947** | | | | | 2.6 | 0.69 | 3.3 | 3.3 |
| **3949** | | | | | 1.27 | 0.28 | 3.9 | 1.6 |
| **3950** | | | | | 2.27 | 0.42 | 4.9 | 2.2 |
| **3951** | | | | | 2.06 | 0.4 | 3.3 | 2.4 |
| **3952** | | | | | 2.53 | 0.4 | 4 | 3.2 |
| **3953** | | | | | 2.68 | 0.42 | 3.8 | 3.3 |
| **3954** | | | | | 2.42 | 0.35 | 4.2 | 2.9 |
| **3955** | | | | | 2.44 | 0.42 | 3.8 | 3.2 |
| **3956** | | | | | 2.68 | 0.47 | 5 | 3.4 |
| **3957** | | | | | 2.59 | 0.51 | 3.6 | 3.8 |
| **3958** | | | | | 0.58 | 0.25 | 1.7 | 0.8 |
| **3959** | | | | | 2.73 | 0.79 | 3.7 | 3.7 |
| **3960** | | | | | 2.3 | 0.88 | 2.8 | 3.3 |
| **3962** | | | | | 2.22 | 0.9 | 3.4 | 3.4 |
| **3963** | | | | | 2.25 | 0.98 | 2.9 | 3 |
| **3966** | | | | | 1.89 | 1.04 | 3.3 | 3.6 |
| **3969** | | | | | 2.71 | 0.39 | 6 | 2.8 |
| **3970** | | | | | 2.17 | 0.25 | 4.3 | 2.5 |
| **3971** | | | | | 1.59 | 0.23 | 3.8 | 2.2 |
| **3972** | | | | | 2.54 | 0.39 | 5 | 3.2 |
| **3973** | | | | | 2.42 | 0.38 | 3.9 | 3.1 |
| **3974** | | | | | 2.46 | 0.35 | 3.6 | 3.2 |
| **3975** | | | | | 2.17 | 0.43 | 1.9 | 2.3 |
| **3977** | | | | | 1.06 | 0.4 | 6.3 | 1.5 |
| **3978** | | | | | 2.02 | 0.48 | 2.8 | 2.1 |
| **3980** | | | | | 0.6 | 0.35 | 2.3 | 1 |
| **3981** | | | | | 0.63 | 0.32 | 3.4 | 1 |
| **3982** | | | | | 2.1 | 0.45 | 3.2 | 2.7 |
| **3984** | | | | | 2.21 | 0.88 | 4.9 | 2.2 |
| **4523** | | | | | 3.53 | 1.24 | 5.8 | 3.6 |
| **4525** | | | | | 3.19 | 1.99 | 4.5 | 4.3 |
| **4527** | | | | | 1.5 | 1.04 | 3.2 | 1.9 |
| **4528** | | | | | 2.75 | 1.35 | 5.3 | 3.1 |
| **4529** | | | | | 2.84 | 1.53 | 4.8 | 3.2 |

| **Element** | **Sn** | **Sr** | **Ta** | **Te** | **Th** | **Ti** | **Tl** | **U** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.5** | **0.05** | **0.02** | **0.1** | **0.001** | **0.02** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **3932** | | 18.3 | | 0.03 | 2.3 | 0.01 | 0.02 | 0.28 |
| **3933** | | 63.9 | | 0.07 | 6.7 | < .001 | 0.11 | 0.78 |
| **3934** | | 19.9 | | 0.05 | 4.5 | 0.016 | 0.05 | 0.51 |
| **3935** | | 26.7 | | 0.03 | 4.9 | 0.008 | 0.06 | 0.49 |
| **3936** | | 21 | | < .02 | 2.6 | 0.009 | 0.03 | 0.31 |
| **3937** | | 29.5 | | 0.03 | 4.2 | 0.003 | 0.06 | 0.52 |
| **3938** | | 31.5 | | 0.03 | 4.2 | 0.006 | 0.06 | 0.53 |
| **3939** | | 83.6 | | 0.12 | 5.3 | 0.01 | 0.23 | 3.46 |
| **3940** | | 80.4 | | 0.12 | 5.4 | 0.011 | 0.3 | 4.26 |
| **3941** | | 88.9 | | 0.07 | 5.8 | 0.012 | 0.32 | 5.29 |
| **3942** | | 165.2 | | 0.08 | 5.1 | 0.003 | 0.44 | 7.88 |
| **3943** | | 150.3 | | < .02 | 3.1 | 0.006 | 0.46 | 4.01 |
| **3944** | | 113.3 | | 0.04 | 3.2 | 0.012 | 0.52 | 3.63 |
| **3945** | | 70.6 | | 0.03 | 3 | 0.009 | 0.42 | 4.02 |
| **3946** | | 66.8 | | 0.1 | 5.8 | 0.003 | 0.57 | 4.57 |
| **3947** | | 80.5 | | 0.11 | 6.5 | < .001 | 0.56 | 4.66 |
| **3949** | | 87.1 | | 0.08 | 5.7 | 0.005 | 0.15 | 1.66 |
| **3950** | | 93.6 | | 0.09 | 5.1 | < .001 | 0.23 | 2.58 |
| **3951** | | 87 | | 0.1 | 5.5 | < .001 | 0.21 | 3.42 |
| **3952** | | 83.5 | | 0.11 | 5.1 | 0.002 | 0.27 | 3.52 |
| **3953** | | 82.3 | | 0.12 | 5.3 | < .001 | 0.32 | 3.99 |
| **3954** | | 90.5 | | 0.14 | 5.5 | 0.007 | 0.26 | 3.72 |
| **3955** | | 87.6 | | 0.15 | 5.3 | < .001 | 0.31 | 4.34 |
| **3956** | | 96.6 | | 0.1 | 5.2 | < .001 | 0.38 | 5.04 |
| **3957** | | 95 | | 0.11 | 5.6 | 0.001 | 0.6 | 5.86 |
| **3958** | | 174.2 | | 0.03 | 2.1 | 0.003 | 0.28 | 1.69 |
| **3959** | | 78.6 | | 0.1 | 4.3 | 0.002 | 0.83 | 5.94 |
| **3960** | | 102 | | 0.1 | 4.4 | < .001 | 0.97 | 3.71 |
| **3962** | | 111.3 | | 0.08 | 4.6 | < .001 | 0.95 | 3.5 |
| **3963** | | 139.8 | | 0.09 | 4.1 | < .001 | 0.84 | 4.17 |
| **3966** | | 114.9 | | 0.08 | 5 | 0.003 | 1.01 | 3.89 |
| **3969** | | 111.2 | | 0.07 | 5.4 | 0.003 | 0.22 | 4.09 |
| **3970** | | 91 | | 0.06 | 5.6 | < .001 | 0.19 | 3.06 |
| **3971** | | 93.9 | | 0.08 | 6 | < .001 | 0.17 | 2.37 |
| **3972** | | 99.8 | | 0.11 | 5.4 | < .001 | 0.27 | 4.22 |
| **3973** | | 87.3 | | 0.09 | 5.4 | 0.002 | 0.26 | 3,34 |
| **3974** | | 81.9 | | 0.1 | 5.2 | 0.004 | 0.3 | 3.4 |
| **3975** | | 69.9 | | 0.06 | 5.4 | 0.001 | 0.31 | 2.97 |
| **3977** | | 172.7 | | 0.06 | 3.8 | < .001 | 0.36 | 5.73 |
| **3978** | | 83.2 | | 0.06 | 4.6 | < .001 | 0.45 | 3.92 |
| **3980** | | 174.2 | | < .02 | 2.7 | 0.003 | 0.38 | 4.16 |
| **3981** | | 118.7 | | 0.03 | 2.5 | 0.007 | 0.35 | 2.97 |
| **3982** | | 72.6 | | 0.08 | 5.5 | 0.012 | 0.42 | 4.24 |
| **3984** | | 112.6 | | 0.06 | 4.5 | 0.006 | 0.16 | 2.64 |
| **4523** | | 148.3 | | 0.11 | 4.5 | < .001 | 0.15 | 5.33 |
| **4525** | | 152.3 | | 0.12 | 4.2 | < .001 | 0.28 | 3.61 |
| **4527** | | 169.8 | | 0.04 | 2.6 | < .001 | 0.19 | 2.34 |
| **4528** | | 130.8 | | 0.13 | 4.6 | < .001 | 0.26 | 2.44 |
| **4529** | | 107.7 | | 0.15 | 5.5 | 0.002 | 0.33 | 2.18 |

***Analysis: GROUP 1EX - 0.25 GM***

| **Element** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ag** | **Al** | **As** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.1** | **0.01** | **0.1** | **0.1** | **0.1** | **0.01** | **1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** |
| **3932** | 13 | <.1 | | 28.2 | | | | |
| **3933** | 45 | <.1 | | 116.9 | | | | |
| **3934** | 22 | <.1 | | 61.8 | | | | |
| **3935** | 22 | <.1 | | 71 | | | | |
| **3936** | 10 | <.1 | | 32.8 | | | | |
| **3937** | 20 | <.1 | | 62.5 | | | | |
| **3938** | 19 | <.1 | | 61.9 | | | | |
| **3939** | 43 | <.1 | | 125.5 | | | | |
| **3940** | 44 | <.1 | | 137.1 | | | | |
| **3941** | 46 | <.1 | | 95.3 | | | | |
| **3942** | 50 | <.1 | | 81.3 | | | | |
| **3943** | 33 | <.1 | | 43.5 | | | | |
| **3944** | 31 | <.1 | | 47.6 | | | | |
| **3945** | 32 | <.1 | | 63 | | | | |
| **3946** | 46 | <.1 | | 131.9 | | | | |
| **3947** | 51 | <.1 | | 125.3 | | | | |
| **3949** | 33 | <.1 | | 108.2 | | | | |
| **3950** | 35 | <.1 | | 114.8 | | | | |
| **3951** | 32 | <.1 | | 119.1 | | | | |
| **3952** | 35 | <.1 | | 128.5 | | | | |
| **3953** | 40 | <.1 | | 131.1 | | | | |
| **3954** | 35 | <.1 | | 147 | | | | |
| **3955** | 40 | <.1 | | 125.4 | | | | |
| **3956** | 43 | <.1 | | 111.4 | | | | |
| **3957** | 47 | <.1 | | 131.6 | | | | |
| **3958** | 28 | <.1 | | 34.6 | | | | |
| **3959** | 57 | <.1 | | 148 | | | | |
| **3960** | 65 | <.1 | | 132.7 | | | | |
| **3962** | 68 | <.1 | | 152.4 | | | | |
| **3963** | 56 | <.1 | | 122.8 | | | | |
| **3966** | 71 | <.1 | | 140.6 | | | | |
| **3969** | 33 | <.1 | | 124.3 | | | | |
| **3970** | 33 | <.1 | | 122.2 | | | | |
| **3971** | 32 | <.1 | | 118.9 | | | | |
| **3972** | 36 | <.1 | | 135.6 | | | | |
| **3973** | 37 | <.1 | | 129.4 | | | | |
| **3974** | 37 | <.1 | | 127.4 | | | | |
| **3975** | 35 | <.1 | | 97.9 | | | | |
| **3977** | 44 | <.1 | | 75.2 | | | | |
| **3978** | 36 | <.1 | | 88.2 | | | | |
| **3980** | 31 | <.1 | | 43.1 | | | | |
| **3981** | 36 | <.1 | | 47.1 | | | | |
| **3982** | 41 | <.1 | | 117.6 | | | | |
| **3984** | 30 | <.1 | | 156.4 | | | | |
| **4523** | 34 | <.1 | | 169.8 | | | | |
| **4525** | 47 | <.1 | | 157.4 | | | | |
| **4527** | 67 | <.1 | | 82.5 | | | | |
| **4528** | 37 | <.1 | | 139.2 | | | | |
| **4529** | 47 | <.1 | | 123.3 | | | | |

| Samples | Hole | Latitude | Longitude | From (m) | To (m) | Analysis Date |
|---|---|---|---|---|---|---|
| **4530** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2376.790 | 2376.770 | Dec. 2003 |
| **4531** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2377.790 | 2377.860 | Dec. 2003 |
| **4532** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2378.875 | 2378.955 | Dec. 2003 |
| **4533** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2379.895 | 2379.965 | Dec. 2003 |
| **4534** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2380.870 | 2380.940 | Dec. 2003 |
| **4535** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2381.985 | 2382.055 | Dec. 2003 |
| **4536** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2382.975 | 2383.045 | Dec. 2003 |
| **4537** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2383.725 | 2383.795 | Dec. 2003 |
| **4538** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2384.815 | 2384.885 | Dec. 2003 |
| **4539** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2385.790 | 2385.860 | Dec. 2003 |
| **4540** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2386.780 | 2386.850 | Dec. 2003 |
| **4541** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2387.705 | 2387.775 | Dec. 2003 |
| **4542** | 00/15-21-056-19W5/0 | 53.857979 | -116.756922 | 2388.795 | 2388.865 | Dec. 2003 |
| **4543** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1252.500 | 1252.510 | Dec. 2003 |
| **4544** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1253.500 | 1253.100 | Dec. 2003 |
| **4546** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1254.485 | 1254.495 | Dec. 2003 |
| **4548** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1255.500 | 1255.510 | Dec. 2003 |
| **4549** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1256.500 | 1256.510 | Dec. 2003 |
| **4551** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1257.500 | 1257.515 | Dec. 2003 |
| **4552** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1258.500 | 1258.510 | Dec. 2003 |
| **4552** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1258.500 | 1258.510 | April 2004 |
| **4553** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1259.500 | 1259.510 | Dec. 2003 |
| **4554** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1260.500 | 1260.520 | Dec. 2003 |
| **4555** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1261.510 | 1261.520 | Dec. 2003 |
| **4555** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1261.510 | 1261.520 | April 2004 |
| **4556** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1262.500 | 1262.510 | Dec. 2003 |
| **4557** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1263.540 | 1263.550 | Dec. 2003 |
| **4558** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1264.500 | 1264.510 | Dec. 2003 |
| **4559** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1265.500 | 1265.510 | Dec. 2003 |
| **4560** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1266.500 | 1266.510 | Dec. 2003 |
| **4561** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1267.500 | 1267.510 | Dec. 2003 |
| **4562** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1268.500 | 1268.510 | Dec. 2003 |
| **4563** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1269.500 | 1269.520 | Dec. 2003 |
| **4564** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1270.500 | 1270.520 | Dec. 2003 |
| **4565** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1271.500 | 1271.510 | Dec. 2003 |
| **4566** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1272.500 | 1272.510 | Dec. 2003 |
| **4568** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1273.500 | 1273.510 | Dec. 2003 |
| **4569** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1274.500 | 1274.510 | Dec. 2003 |
| **4572** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1275.500 | 1275.510 | Dec. 2003 |
| **4573** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1276.500 | 1276.510 | Dec. 2003 |
| **4574** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1277.500 | 1277.510 | Dec. 2003 |
| **4575** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1278.500 | 1278.510 | Dec. 2003 |
| **4576** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1279.500 | 1279.550 | Dec. 2003 |
| **4577** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1280.500 | 1280.510 | Dec. 2003 |
| **4578** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1281.500 | 1281.510 | Dec. 2003 |
| **4580** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1282.500 | 1282.510 | Dec. 2003 |
| **4581** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1283.500 | 1283.510 | Dec. 2003 |
| **4582** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1284.500 | 1284.510 | Dec. 2003 |

| Samples | Probability of Fm | Formation | Sample Description |
|---|---|---|---|
| 4530 | Unknown | Second White Specks | Broken fragments of dk grey shale, minor silt |
| 4531 | Unknown | Second White Specks | Broken fragments of dk grey shale, some silt |
| 4532 | Unknown | Second White Specks | Broken fragments of dk grey shale, some silt |
| 4533 | Unknown | Second White Specks | Broken fragments of dk grey shale, some silt, some shelly debris |
| 4534 | Unknown | Second White Specks | Broken fragments of dk grey shale, some silt |
| 4535 | Unknown | Second White Specks | Broken fragments of dk grey shale, some silt |
| 4536 | Unknown | Second White Specks | Broken fragments of dk grey shale, some silt and micas |
| 4537 | Unknown | Second White Specks | Broken fragments of dk grey shale, some silty pockets, micas |
| 4538 | Unknown | Second White Specks | Broken fragments of dk grey shale, some silt, smooth |
| 4539 | Unknown | Second White Specks | Broken fragments of dk grey shale, some silt, some fish fragments |
| 4540 | Unknown | Second White Specks | Broken fragments of dk grey shale, some silt |
| 4541 | Unknown | Second White Specks | Broken fragments of dk grey shale, smooth, some silt |
| 4542 | Unknown | Second White Specks | Broken fragments of dk grey shale, smooth, some silt |
| 4543 | Unknown | Second White Specks | Dk grey shale, some silt |
| 4544 | Unknown | Second White Specks | Dk grey shale, silty |
| 4546 | Unknown | Second White Specks | Dk grey shale (calcareous) - micropaleo? |
| 4548 | Unknown | Second White Specks | Dk grey shale, fish remains, some silt |
| 4549 | Unknown | Second White Specks | Dk grey shale, abundant white specks |
| 4551 | Unknown | Second White Specks | Dk grey shale, fish fragments, some silt, some white specks |
| 4552 | Unknown | Second White Specks | Dk grey shale, micas, some silt |
| 4552 | Unknown | Second White Specks | Dk grey shale, micas, some silt |
| 4553 | Unknown | Second White Specks | Dk grey shale, some silt, some black organic fragments |
| 4554 | Unknown | Second White Specks | Dk grey shale, some silt and fish fragments |
| 4555 | Unknown | Second White Specks | Dk grey shale, some silt, shelly fragments |
| 4555 | Unknown | Second White Specks | Dk grey shale, some silt, shelly fragments |
| 4556 | Unknown | Second White Specks | Dk grey shale, white specks, some silt |
| 4557 | Unknown | Second White Specks | Dk grey shale, some fish debris, micas |
| 4558 | Unknown | Second White Specks | Dk grey shale, some silt |
| 4559 | Unknown | Second White Specks | Dk grey , some silt |
| 4560 | Unknown | Second White Specks | Dk grey shale, some silt, very fissile |
| 4561 | Unknown | Second White Specks | Dk grey shale, silty/sandy pockets |
| 4562 | Unknown | Second White Specks | Dk grey shale, silt, some shelly fragments |
| 4563 | Unknown | Second White Specks | Dk grey shale, some silt, some shelly remains |
| 4564 | Unknown | Second White Specks | Dk grey shale, silty pockets |
| 4565 | Unknown | Second White Specks | Dk grey shale, some shelly remains, some silt |
| 4566 | Unknown | Second White Specks | Dk grey shale, silt, white specks/sand |
| 4568 | Unknown | Second White Specks | Dk grey shale, some silt, white specks?/sand |
| 4569 | Unknown | Second White Specks | Dk grey shale, white specks |
| 4572 | Unknown | Second White Specks | Dk grey shale, abundant white specks |
| 4573 | Unknown | Second White Specks | Dk grey shale, some silt |
| 4574 | Unknown | Second White Specks | Dk grey shale, white specks,, micas, some black organic remains |
| 4575 | Unknown | Second White Specks | Dk grey shale, fish fragments, micas, silty |
| 4576 | Unknown | Second White Specks | Dk grey shale, a few micas |
| 4577 | Unknown | Second White Specks | Dk grey shale, micas, fish fragments |
| 4578 | Unknown | Second White Specks | Dk grey shale, a little silt |
| 4580 | Unknown | Second White Specks | Dk grey shale, white specks, fish remains |
| 4581 | Unknown | Second White Specks | Dk grey shale, abundant fish debris, silt |
| 4582 | Unknown | Second White Specks | Dk grey shale, fish debris, micas |

***Analysis: GROUP 1F1 - 1.00 GM***

| **Element** | **Ag** | **Al** | **As** | **Au** | **B** | **Ba** | **Be** | **Bi** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** | **0.1** | **0.02** |
| **Samples** | **ppb** | **%** | **ppm** | **ppb** | **ppm** | **ppm** | **ppm** | **ppm** |
| **4530** | 182 | 0.76 | 22.6 | < .2 | 7 | 54.9 | | 0.23 |
| **4531** | 164 | 0.86 | 21.6 | 0.3 | 7 | 57 | | 0.25 |
| **4532** | 164 | 0.81 | 17.2 | < .2 | 7 | 54.9 | | 0.23 |
| **4533** | 171 | 0.87 | 16.2 | 0.2 | 7 | 62 | | 0.26 |
| **4534** | 189 | 0.8 | 19 | 0.5 | 7 | 60.8 | | 0.26 |
| **4535** | 176 | 0.86 | 17.9 | < .2 | 7 | 56.8 | | 0.28 |
| **4536** | 162 | 0.87 | 20.6 | < .2 | 6 | 47 | | 0.28 |
| **4537** | 165 | 0.89 | 21.6 | < .2 | 6 | 48.5 | | 0.27 |
| **4538** | 167 | 0.87 | 19.6 | < .2 | 7 | 55.3 | | 0.27 |
| **4539** | 168 | 0.9 | 20.9 | < .2 | 7 | 46.3 | | 0.26 |
| **4540** | 229 | 0.91 | 23.8 | < .2 | 8 | 54 | | 0.31 |
| **4541** | 259 | 0.89 | 21.6 | < .2 | 8 | 50.3 | | 0.27 |
| **4542** | 228 | 0.8 | 19.8 | 0.3 | 7 | 43.7 | | 0.27 |
| **4543** | 353 | 0.73 | 23.3 | 0.5 | 16 | 115.8 | 0.8 | 0.24 |
| **4544** | 321 | 0.96 | 29.1 | 1 | 12 | 53.5 | | 0.25 |
| **4546** | 227 | 0.95 | 30.2 | 0.3 | 11 | 56 | | 0.38 |
| **4548** | 277 | 0.99 | 28.2 | 0.3 | 10 | 41.4 | | 0.26 |
| **4549** | 251 | 0.82 | 27.5 | 0.2 | 16 | 48 | 0.7 | 0.29 |
| **4551** | 307 | 0.99 | 27.3 | 0.6 | 11 | 42.3 | | 0.31 |
| **4552** | 344 | 1.14 | 32.9 | 0.7 | 13 | 33.9 | | 0.31 |
| **4553** | 304 | 1.01 | 28.2 | 0.5 | 12 | 40 | | 0.34 |
| **4554** | 286 | 0.94 | 25.1 | 0.5 | 15 | 46.2 | 0.5 | 0.31 |
| **4555** | 292 | 1.2 | 22.7 | 0.6 | 13 | 54.5 | | 0.31 |
| **4556** | 224 | 0.87 | 16.6 | 0.8 | 11 | 62.9 | | 0.23 |
| **4557** | 277 | 1.32 | 23.3 | 0.3 | 13 | 51.6 | | 0.27 |
| **4558** | 270 | 0.92 | 26.3 | 0.2 | 14 | 53.4 | 0.8 | 0.3 |
| **4559** | 256 | 1.2 | 27.8 | 0.8 | 12 | 45.4 | | 0.31 |
| **4560** | 216 | 1.25 | 35.7 | 0.7 | 11 | 39.6 | | 0.28 |
| **4561** | 254 | 1.09 | 38.7 | 0.8 | 9 | 36.9 | | 0.31 |
| **4562** | 234 | 1.07 | 32.3 | 0.9 | 15 | 60.2 | 1 | 0.32 |
| **4563** | 219 | 1.13 | 35.2 | 0.8 | 10 | 57.4 | | 0.31 |
| **4564** | 237 | 1.06 | 36.6 | 0.5 | 10 | 55.3 | | 0.33 |
| **4565** | 245 | 1.19 | 35.9 | 0.9 | 11 | 54.6 | | 0.36 |
| **4566** | 240 | 0.86 | 31 | 0.3 | 13 | 81.5 | 0.9 | 0.25 |
| **4568** | 247 | 0.67 | 25.3 | 0.2 | 10 | 141.3 | | 0.27 |
| **4569** | 91 | 0.45 | 10.5 | 0.4 | 7 | 242 | | 0.08 |
| **4572** | 251 | 0.69 | 24.2 | 0.4 | 10 | 89.4 | | 0.25 |
| **4573** | 299 | 0.97 | 31.4 | 1.8 | 15 | 65.8 | 0.6 | 0.33 |
| **4574** | 307 | 1.12 | 30.7 | 0.5 | 14 | 51.3 | | 0.35 |
| **4575** | 269 | 0.91 | 30.6 | 0.7 | 13 | 93 | | 0.25 |
| **4576** | 191 | 1.08 | 22.7 | 0.6 | 13 | 68.4 | | 0.37 |
| **4577** | 281 | 1.05 | 24.1 | 0.3 | 16 | 73.1 | 1.1 | 0.32 |
| **4578** | 233 | 1.07 | 28.7 | 0.6 | 12 | 55.7 | | 0.36 |
| **4580** | 300 | 1.18 | 35.7 | 0.8 | 15 | 51.5 | | 0.42 |
| **4581** | 282 | 1.02 | 35.6 | 0.3 | 13 | 42.2 | | 0.37 |
| **4582** | 361 | 1.1 | 42.8 | 0.4 | 17 | 47.2 | 0.9 | 0.41 |

| **Element** | **Ca** | **Cd** | **Ce** | **Co** | **Cr** | **Cs** | **Cu** | **Fe** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **0.01** | **0.1** | **0.1** | **0.5** | **0.02** | **0.01** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **4530** | 1.99 | 0.53 | | 12.3 | 13.9 | | 30.06 | 2.57 |
| **4531** | 1.73 | 0.51 | | 13.1 | 15.8 | | 28.78 | 2.69 |
| **4532** | 1.75 | 0.35 | | 12.3 | 15 | | 27.69 | 2.67 |
| **4533** | 1.92 | 0.46 | | 12.3 | 15.1 | | 27.73 | 2.72 |
| **4534** | 1.81 | 0.42 | | 13 | 14.8 | | 28.82 | 2.77 |
| **4535** | 1.4 | 0.5 | | 13.5 | 14.1 | | 28.83 | 2.82 |
| **4536** | 1.74 | 0.53 | | 13.1 | 15 | | 28.08 | 3.1 |
| **4537** | 2.02 | 0.41 | | 13 | 15 | | 28.3 | 3.27 |
| **4538** | 1.81 | 0.58 | | 13.3 | 14.3 | | 28.07 | 3.03 |
| **4539** | 1.99 | 0.49 | | 13.3 | 14.4 | | 28.57 | 3.19 |
| **4540** | 1.4 | 0.78 | | 15.3 | 13.9 | | 34.77 | 3.18 |
| **4541** | 1.75 | 0.78 | | 15.2 | 14 | | 34.89 | 3.22 |
| **4542** | 1.89 | 1.03 | | 13.4 | 12.9 | | 32.89 | 3.07 |
| **4543** | 8.58 | 1.61 | 13.4 | 12.1 | 14.1 | 1.05 | 38.82 | 2.12 |
| **4544** | 5.47 | 1.36 | | 17.1 | 17.5 | | 39.96 | 3.05 |
| **4546** | 4.99 | 1.14 | | 12.3 | 13.9 | | 30.5 | 2.83 |
| **4548** | 4.24 | 1.41 | | 15.9 | 18.5 | | 40.49 | 3.4 |
| **4549** | 3.47 | 1.1 | 13.1 | 15.8 | 15.9 | 1.37 | 38.31 | 3.32 |
| **4551** | 3.41 | 1.55 | | 17.2 | 22.5 | | 48.24 | 3.72 |
| **4552** | 2.7 | 2.95 | | 19 | 26.3 | | 57.51 | 4.41 |
| **4553** | 3.19 | 0.98 | | 16.2 | 21.1 | | 44.51 | 3.93 |
| **4554** | 2.58 | 1.04 | 12.5 | 15.1 | 18.1 | 1.4 | 43.2 | 3.71 |
| **4555** | 3.95 | 2.01 | | 15.3 | 23.4 | | 38.49 | 3.56 |
| **4556** | 5.62 | 1.16 | | 12.6 | 17.7 | | 34.12 | 2.99 |
| **4557** | 2.69 | 1.89 | | 14.9 | 23.8 | | 37.09 | 3.27 |
| **4558** | 1.71 | 1.27 | 13.2 | 14.7 | 17.4 | 1.45 | 40.85 | 3.31 |
| **4559** | 1.57 | 1.18 | | 14.8 | 21.7 | | 39.06 | 3.37 |
| **4560** | 1.59 | 0.73 | | 14.8 | 24.2 | | 35.58 | 4.35 |
| **4561** | 1 | 1.22 | | 15.8 | 20.1 | | 37.8 | 3.47 |
| **4562** | 2.94 | 0.79 | 12.6 | 14.6 | 19.6 | 1.56 | 37.52 | 3.19 |
| **4563** | 3.54 | 0.99 | | 14.6 | 22.1 | | 35.39 | 3.3 |
| **4564** | 3.34 | 0.88 | | 15.2 | 20.2 | | 34.84 | 3.19 |
| **4565** | 2.54 | 0.86 | | 15.4 | 21.6 | | 38.32 | 3.17 |
| **4566** | 7.69 | 1.06 | 12.2 | 13.4 | 16.9 | 1.32 | 35.58 | 3.06 |
| **4568** | 14.9 | 1.74 | | 13.4 | 15.5 | | 39.58 | 2.5 |
| **4569** | 14.58 | 0.44 | | 4.6 | 10.1 | | 14.28 | 4.39 |
| **4572** | 8.09 | 1.22 | | 12.4 | 15.3 | | 37.9 | 3.22 |
| **4573** | 4.89 | 1.24 | 13.1 | 17 | 19.8 | 1.32 | 49.45 | 2.99 |
| **4574** | 2.47 | 1.67 | | 17.6 | 22.5 | | 49.63 | 3 |
| **4575** | 8.3 | 1.14 | | 14.6 | 18.5 | | 38.99 | 3.11 |
| **4576** | 1.27 | 0.6 | | 14 | 19.3 | | 36.29 | 2.72 |
| **4577** | 3.2 | 0.9 | 34.1 | 13.4 | 22.6 | 1.51 | 38.13 | 3.03 |
| **4578** | 2.14 | 0.81 | | 13.7 | 20.6 | | 39.99 | 3.21 |
| **4580** | 0.7 | 0.79 | | 16.9 | 24.4 | | 45.63 | 3.51 |
| **4581** | 0.95 | 0.83 | | 15.4 | 21.9 | | 41.93 | 3.41 |
| **4582** | 2.06 | 1.03 | 14.4 | 19.4 | 21.1 | 1.59 | 50.18 | 4.12 |

| Element | Ga | Ge | Hf | Hg | In | K | La | Li |
|---|---|---|---|---|---|---|---|---|
| LDL | 0.1 | 0.1 | 0.02 | 5 | 0.02 | 0.01 | 0.5 | 0.1 |
| Samples | ppm | ppm | ppm | ppb | ppm | % | ppm | ppm |
| **4530** | 2.1 | | | 66 | | 0.22 | 2.8 | |
| **4531** | 2.4 | | | 71 | | 0.23 | 2.4 | |
| **4532** | 2.3 | | | 65 | | 0.21 | 2.5 | |
| **4533** | 2.4 | | | 68 | | 0.23 | 2.6 | |
| **4534** | 2.3 | | | 79 | | 0.2 | 2.5 | |
| **4535** | 2.5 | | | 77 | | 0.22 | 2.5 | |
| **4536** | 2.6 | | | 84 | | 0.22 | 2.6 | |
| **4537** | 2.6 | | | 74 | | 0.23 | 2.7 | |
| **4538** | 2.5 | | | 62 | | 0.22 | 2.6 | |
| **4539** | 2.6 | | | 55 | | 0.24 | 2.6 | |
| **4540** | 2.7 | | | 66 | | 0.22 | 2.6 | |
| **4541** | 2.6 | | | 87 | | 0.23 | 2.9 | |
| **4542** | 2.3 | | | 79 | | 0.21 | 2.9 | |
| **4543** | 3.4 | < .1 | 0.08 | 257 | 0.03 | 0.27 | 6.3 | ~~9.8~~ |
| **4544** | 4.5 | | | 156 | | 0.32 | 7.9 | |
| **4546** | 6 | | | 145 | | 0.28 | 10.4 | |
| **4548** | 4.5 | | | 182 | | 0.32 | 8 | |
| **4549** | 3.8 | < .1 | 0.1 | 139 | 0.05 | 0.29 | 6.5 | 13.3 |
| **4551** | 5.1 | | | 176 | | 0.3 | 7.7 | |
| **4552** | 5.3 | | | 196 | | 0.36 | 7 | |
| **4553** | 4.7 | | | 168 | | 0.29 | 7.6 | |
| **4554** | 3.7 | < .1 | 0.14 | 182 | 0.04 | 0.29 | 6 | 16.2 |
| **4555** | 4.8 | | | 220 | | 0.36 | 7.2 | |
| **4556** | 4 | | | 104 | | 0.25 | 8 | |
| **4557** | 5.7 | | | 223 | | 0.4 | 8.1 | |
| **4558** | 4.1 | < .1 | 0.1 | 247 | 0.05 | 0.26 | 6.5 | 15.7 |
| **4559** | 5.1 | | | 155 | | 0.33 | 7.2 | |
| **4560** | 4.8 | | | 486 | | 0.35 | 5.9 | |
| **4561** | 4.1 | | | 576 | | 0.29 | 5.2 | |
| **4562** | 4 | < .1 | 0.1 | 238 | 0.05 | 0.31 | 5.9 | 22.3 |
| **4563** | 4.4 | | | 170 | | 0.31 | 6.3 | |
| **4564** | 4.2 | | | 236 | | 0.28 | 6 | |
| **4565** | 5 | | | 177 | | 0.34 | 6.2 | |
| **4566** | 4 | < .1 | 0.09 | 195 | 0.04 | 0.26 | 5.8 | 15.2 |
| **4568** | 3.4 | | | 315 | | 0.2 | 9.7 | |
| **4569** | 1.6 | | | 90 | | 0.11 | 3.1 | |
| **4572** | 3.1 | | | 148 | | 0.19 | 5.8 | |
| **4573** | 4.4 | < .1 | 0.11 | 205 | 0.04 | 0.31 | 6.3 | 17.7 |
| **4574** | 4.9 | | | 221 | | 0.32 | 7.4 | |
| **4575** | 4.2 | | | 293 | | 0.23 | 11.7 | |
| **4576** | 4.4 | | | 234 | | 0.29 | 6.3 | |
| **4577** | 4.8 | < .1 | 0.16 | 180 | 0.05 | 0.28 | 16.8 | 18.7 |
| **4578** | 4.2 | | | 546 | | 0.3 | 5.6 | |
| **4580** | 4.9 | | | 408 | | 0.33 | 6.5 | |
| **4581** | 4.3 | | | 195 | | 0.28 | 6.5 | |
| **4582** | 5 | < .1 | 0.13 | 727 | 0.06 | 0.31 | 6.8 | 22.2 |

| **Element** | **Mg** | **Mn** | **Mo** | **Na** | **Nb** | **Ni** | **P** | **Pb** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **1** | **0.01** | **0.001** | **0.02** | **0.1** | **0.001** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** |
| **4530** | 0.48 | 79 | 3.54 | 0.2 | | 39.1 | 0.065 | 14.35 |
| **4531** | 0.48 | 75 | 3.64 | 0.201 | | 45 | 0.059 | 14.88 |
| **4532** | 0.53 | 80 | 2.38 | 0.196 | | 38.2 | 0.064 | 14.05 |
| **4533** | 0.54 | 96 | 2.03 | 0.205 | | 37.7 | 0.064 | 15.57 |
| **4534** | 0.56 | 87 | 3.69 | 0.194 | | 41.2 | 0.065 | 15.61 |
| **4535** | 0.52 | 82 | 3.47 | 0.209 | | 45.8 | 0.064 | 16.67 |
| **4536** | 0.58 | 98 | 2.9 | 0.206 | | 39.4 | 0.065 | 15.78 |
| **4537** | 0.64 | 111 | 3.18 | 0.198 | | 39.9 | 0.066 | 15.93 |
| **4538** | 0.65 | 86 | 3.48 | 0.201 | | 41.9 | 0.065 | 15.69 |
| **4539** | 0.48 | 94 | 2.63 | 0.205 | | 39 | 0.062 | 15.56 |
| **4540** | 0.53 | 93 | 4.14 | 0.21 | | 46.3 | 0.062 | 17.71 |
| **4541** | 0.69 | 104 | 4.06 | 0.194 | | 43.6 | 0.067 | 15.67 |
| **4542** | 0.6 | 98 | 3.65 | 0.184 | | 41.2 | 0.068 | 15.46 |
| **4543** | 0.71 | 85 | 15.63 | 0.187 | 0.05 | 51 | 0.068 | 14.57 |
| **4544** | 0.56 | 92 | 10.71 | 0.185 | | 52 | 0.061 | 15.02 |
| **4546** | 0.5 | 95 | 7.71 | 0.2 | | 37.8 | 0.058 | 16.88 |
| **4548** | 0.71 | 112 | 8.44 | 0.19 | | 53.9 | 0.083 | 17.93 |
| **4549** | 0.56 | 91 | 4.55 | 0.233 | 0.06 | 44.8 | 0.073 | 16.51 |
| **4551** | 0.49 | 98 | 6.37 | 0.205 | | 57.2 | 0.07 | 16.36 |
| **4552** | 0.51 | 104 | 10.09 | 0.217 | | 83 | 0.064 | 16.61 |
| **4553** | 0.47 | 104 | 6.47 | 0.213 | | 63.4 | 0.066 | 19.7 |
| **4554** | 0.45 | 96 | 4.17 | 0.213 | 0.05 | 50.1 | 0.068 | 17.47 |
| **4555** | 0.55 | 93 | 3.54 | 0.221 | | 49.4 | 0.062 | 17.93 |
| **4556** | 0.62 | 188 | 5.1 | 0.19 | | 41.2 | 0.068 | 13.16 |
| **4557** | 0.64 | 139 | 13.29 | 0.216 | | 62.3 | 0.067 | 15.58 |
| **4558** | 0.53 | 125 | 12.51 | 0.225 | 0.07 | 58.9 | 0.07 | 16.18 |
| **4559** | 0.62 | 142 | 9.06 | 0.236 | | 53.3 | 0.064 | 17.24 |
| **4560** | 0.57 | 133 | 9.79 | 0.208 | | 46.3 | 0.055 | 15.88 |
| **4561** | 0.34 | 81 | 15.54 | 0.218 | | 75.2 | 0.048 | 19.04 |
| **4562** | 0.32 | 82 | 12.18 | 0.225 | 0.05 | 51.7 | 0.06 | 16.44 |
| **4563** | 0.34 | 85 | 15.82 | 0.222 | | 51.1 | 0.053 | 16.76 |
| **4564** | 0.31 | 75 | 15.8 | 0.216 | | 50.8 | 0.048 | 16.5 |
| **4565** | 0.29 | 80 | 20.84 | 0.227 | | 51.7 | 0.049 | 17 |
| **4566** | 0.51 | 114 | 30.39 | 0.198 | 0.06 | 49 | 0.058 | 12 |
| **4568** | 0.21 | 136 | 37.45 | 0.141 | | 59.8 | 0.083 | 11.89 |
| **4569** | 4.74 | 480 | 10.15 | 0.068 | | 17.1 | 0.027 | 4.74 |
| **4572** | 1.63 | 183 | 25.5 | 0.144 | | 51.1 | 0.057 | 12.61 |
| **4573** | 0.24 | 94 | 31.85 | 0.199 | 0.05 | 64 | 0.072 | 16.41 |
| **4574** | 0.31 | 91 | 30.98 | 0.195 | | 64.7 | 0.101 | 17.1 |
| **4575** | 0.3 | 130 | 33.81 | 0.156 | | 51.3 | 0.129 | 13.17 |
| **4576** | 0.26 | 102 | 12.62 | 0.233 | | 46.3 | 0.068 | 19.08 |
| **4577** | 0.49 | 129 | 24.07 | 0.187 | 0.05 | 49.3 | 0.223 | 17.95 |
| **4578** | 0.23 | 92 | 19.56 | 0.216 | | 48.7 | 0.072 | 19.1 |
| **4580** | 0.25 | 91 | 19.25 | 0.227 | | 58.9 | 0.072 | 21.08 |
| **4581** | 0.22 | 99 | 19.39 | 0.198 | | 54.1 | 0.078 | 17.81 |
| **4582** | 0.24 | 114 | 29.08 | 0.208 | 0.12 | 60.1 | 0.069 | 18.95 |

| **Element** | **Pd** | **Pt** | **Rb** | **Re** | **S** | **Sb** | **Sc** | **Se** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **10** | **2** | **0.1** | **1** | **0.02** | **0.02** | **0.1** | **0.1** |
| **Samples** | **ppb** | **ppb** | **ppm** | **ppb** | **%** | **ppm** | **ppm** | **ppm** |
| **4530** | | | | | 1.96 | 0.66 | 4.4 | 1.6 |
| **4531** | | | | | 1.94 | 0.64 | 4.8 | 1.5 |
| **4532** | | | | | 1.9 | 0.53 | 5 | 1.2 |
| **4533** | | | | | 1.8 | 0.47 | 4.8 | 1.2 |
| **4534** | | | | | 1.87 | 0.61 | 5.4 | 1.4 |
| **4535** | | | | | 1.92 | 0.62 | 5 | 1.4 |
| **4536** | | | | | 2.1 | 0.56 | 4.9 | 1.3 |
| **4537** | | | | | 2.22 | 0.55 | 5.4 | 1.4 |
| **4538** | | | | | 2.01 | 0.57 | 5.3 | 1.3 |
| **4539** | | | | | 2.21 | 0.5 | 5.3 | 1.4 |
| **4540** | | | | | 2.2 | 0.73 | 4.7 | 1.9 |
| **4541** | | | | | 2.2 | 0.83 | 5 | 2 |
| **4542** | | | | | 2.2 | 0.75 | 5.1 | 1.9 |
| **4543** | < 10 | < 2 | 17.3 | 42 | 1.51 | 1.1 | 4.2 | 3.6 |
| **4544** | | | | | 2.44 | 1.12 | 4.4 | 3.8 |
| **4546** | | | | | 2.26 | 1.43 | 4.2 | 2.4 |
| **4548** | | | | | 2.82 | 0.98 | 4.8 | 3.5 |
| **4549** | < 10 | < 2 | 20.5 | 19 | 2.68 | 0.97 | 4.6 | 3.1 |
| **4551** | | | | | 3.14 | 0.82 | 6 | 3.8 |
| **4552** | | | | | 3.92 | 0.89 | 4.4 | 6 |
| **4553** | | | | | 3.26 | 0.76 | 5.1 | 4.4 |
| **4554** | < 10 | < 2 | 20.6 | 21 | 2.84 | 0.77 | 4.9 | 3.1 |
| **4555** | | | | | 2.68 | 0.56 | 6 | 2.8 |
| **4556** | | | | | 2.03 | 0.72 | 6 | 2.9 |
| **4557** | | | | | 2.39 | 0.82 | 6.5 | 5.3 |
| **4558** | < 10 | < 2 | 19.6 | 29 | 2.4 | 1.22 | 4.9 | 5.4 |
| **4559** | | | | | 2.39 | 0.95 | 5.8 | 4.1 |
| **4560** | | | | | 2.6 | 0.73 | 6.5 | 3.6 |
| **4561** | | | | | 2.57 | 0.77 | 4.6 | 6.4 |
| **4562** | < 10 | < 2 | 21.4 | 21 | 2.07 | 0.76 | 5.1 | 2.9 |
| **4563** | | | | | 2.12 | 0.66 | 5.1 | 2.7 |
| **4564** | | | | | 2.05 | 0.73 | 5.3 | 2.7 |
| **4565** | | | | | 2.09 | 0.63 | 4.7 | 2.8 |
| **4566** | < 10 | < 2 | 19.2 | 43 | 1.87 | 0.9 | 6 | 3.2 |
| **4568** | | | | | 1.82 | 1.02 | 4.7 | 4.5 |
| **4569** | | | | | 0.67 | 0.6 | 1.7 | 1.3 |
| **4572** | | | | | 1.65 | 1.11 | 4 | 3.6 |
| **4573** | < 10 | < 2 | 19.8 | 86 | 2.12 | 1.43 | 5.1 | 3.8 |
| **4574** | | | | | 2.08 | 1.23 | 3.6 | 3.9 |
| **4575** | | | | | 2.19 | 1.09 | 5.8 | 3.6 |
| **4576** | | | | | 1.72 | 0.7 | 3.7 | 2 |
| **4577** | < 10 | 2 | 20 | 46 | 1.83 | 0.95 | 5.3 | 2.5 |
| **4578** | | | | | 2.32 | 0.83 | 4 | 2.6 |
| **4580** | | | | | 2.53 | 1.08 | 4.5 | 2.7 |
| **4581** | | | | | 2.61 | 0.79 | 5 | 2.8 |
| **4582** | < 10 | 2 | 22.5 | 56 | 3.23 | 0.98 | 5 | 3.7 |

| Element | Sn | Sr | Ta | Te | Th | Ti | Tl | U |
|---|---|---|---|---|---|---|---|---|
| LDL | 0.1 | 0.5 | 0.05 | 0.02 | 0.1 | 0.001 | 0.02 | 0.1 |
| Samples | ppm | ppm | ppm | ppm | ppm | % | ppm | ppm |
| 4530 |  | 73.9 |  | 0.05 | 4.4 | 0.003 | 0.11 | 1.08 |
| 4531 |  | 71.2 |  | 0.1 | 4.2 | < .001 | 0.2 | 0.87 |
| 4532 |  | 70.1 |  | 0.07 | 4.1 | < .001 | 0.12 | 0.85 |
| 4533 |  | 78.6 |  | 0.07 | 4.4 | 0.001 | 0.1 | 0.89 |
| 4534 |  | 72.5 |  | 0.08 | 4.6 | 0.002 | 0.15 | 0.98 |
| 4535 |  | 65.9 |  | 0.08 | 4.2 | 0.001 | 0.19 | 0.89 |
| 4536 |  | 69.2 |  | 0.07 | 4.5 | < .001 | 0.12 | 0.95 |
| 4537 |  | 71.7 |  | 0.08 | 4.4 | 0.004 | 0.11 | 1.09 |
| 4538 |  | 69.6 |  | 0.13 | 4.5 | < .001 | 0.14 | 0.89 |
| 4539 |  | 78 |  | 0.1 | 4.5 | < .001 | 0.1 | 1.06 |
| 4540 |  | 63.7 |  | 0.11 | 4.8 | 0.001 | 0.17 | 1.19 |
| 4541 |  | 63.8 |  | 0.11 | 4.6 | < .001 | 0.11 | 1.51 |
| 4542 |  | 66.1 |  | 0.12 | 4.6 | < .001 | 0.09 | 1.73 |
| 4543 | 0.5 | 243.8 | < .05 | 0.08 | 4.3 | 0.003 | 0.43 | 4.3 |
| 4544 |  | 126 |  | 0.19 | 4.8 | < .001 | 0.36 | 3.99 |
| 4546 |  | 121.1 |  | 0.15 | 9.2 | 0.004 | 0.45 | 5.63 |
| 4548 |  | 121.4 |  | 0.11 | 5 | < .001 | 0.4 | 3.86 |
| 4549 | 0.5 | 118.7 | < .05 | 0.11 | 5.2 | < .001 | 0.2 | 2.06 |
| 4551 |  | 114.5 |  | 0.16 | 5 | < .001 | 0.32 | 3.13 |
| 4552 |  | 98.6 |  | 0.19 | 4.9 | < .001 | 0.49 | 2.42 |
| 4553 |  | 98.6 |  | 0.17 | 5.9 | 0.011 | 0.5 | 2.67 |
| 4554 | 0.6 | 96.2 | < .05 | 0.15 | 5.2 | 0.006 | 0.19 | 1.55 |
| 4555 |  | 150 |  | 0.13 | 6 | < .001 | 0.24 | 1.36 |
| 4556 |  | 134.3 |  | 0.14 | 4.8 | < .001 | 0.15 | 4.11 |
| 4557 |  | 101.6 |  | 0.11 | 5.5 | 0.004 | 0.45 | 4.5 |
| 4558 | 0.6 | 83.3 | < .05 | 0.22 | 5.4 | 0.006 | 0.45 | 3.5 |
| 4559 |  | 88.8 |  | 0.21 | 5.6 | 0.001 | 0.44 | 3.12 |
| 4560 |  | 77.6 |  | 0.14 | 4.8 | < .001 | 0.22 | 3.54 |
| 4561 |  | 71.7 |  | 0.17 | 5.2 | < .001 | 0.56 | 2.98 |
| 4562 | 0.6 | 119.1 | < .05 | 0.09 | 5.5 | 0.005 | 0.3 | 3.3 |
| 4563 |  | 131.5 |  | 0.12 | 5.4 | < .001 | 0.24 | 3.41 |
| 4564 |  | 128.4 |  | 0.09 | 5.6 | < .001 | 0.29 | 3.37 |
| 4565 |  | 106.6 |  | 0.1 | 5.4 | < .001 | 0.24 | 4.38 |
| 4566 | 0.5 | 196.3 | < .05 | 0.09 | 4.4 | < .001 | 0.19 | 8.19 |
| 4568 |  | 300.4 |  | 0.06 | 4.2 | 0.002 | 0.36 | 15.83 |
| 4569 |  | 222.3 |  | 0.02 | 1.5 | 0.002 | 0.14 | 3.47 |
| 4572 |  | 158 |  | 0.08 | 3.7 | 0.001 | 0.32 | 7.17 |
| 4573 | 0.6 | 119.1 | < .05 | 0.09 | 4.6 | 0.008 | 0.27 | 8.2 |
| 4574 |  | 86.2 |  | 0.11 | 4.9 | 0.001 | 0.38 | 10.89 |
| 4575 |  | 204.1 |  | 0.05 | 4.7 | 0.001 | 0.25 | 16.19 |
| 4576 |  | 84 |  | 0.08 | 6.2 | 0.001 | 0.23 | 3.07 |
| 4577 | 0.8 | 129.1 | < .05 | 0.09 | 6.1 | 0.009 | 0.24 | 20.49 |
| 4578 |  | 84.2 |  | 0.1 | 5.1 | 0.001 | 0.2 | 4.51 |
| 4580 |  | 72.8 |  | 0.08 | 5.7 | 0.001 | 0.33 | 5.13 |
| 4581 |  | 68.9 |  | 0.09 | 5.3 | 0.002 | 0.32 | 7.16 |
| 4582 | 0.7 | 85.5 | < .05 | 0.12 | 5.7 | 0.002 | 0.4 | 9.6 |

***Analysis: GROUP 1EX - 0.25 GM***

| **Element** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ag** | **Al** | **As** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.1** | **0.01** | **0.1** | **0.1** | **0.1** | **0.01** | **1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** |
| **4530** | 25 | < .1 | | 126.9 | | | | |
| **4531** | 28 | < .1 | | 116.5 | | | | |
| **4532** | 25 | < .1 | | 101.8 | | | | |
| **4533** | 27 | < .1 | | 150.2 | | | | |
| **4534** | 26 | < .1 | | 105.7 | | | | |
| **4535** | 28 | < .1 | | 130.7 | | | | |
| **4536** | 27 | < .1 | | 152.5 | | | | |
| **4537** | 29 | < .1 | | 108.5 | | | | |
| **4538** | 28 | < .1 | | 161.7 | | | | |
| **4539** | 28 | < .1 | | 122.5 | | | | |
| **4540** | 29 | < .1 | | 135.1 | | | | |
| **4541** | 28 | < .1 | | 124 | | | | |
| **4542** | 24 | < .1 | | 160.6 | | | | |
| **4543** | 80 | < .1 | 9.82 | 143 | 2.9 | 0.3 | 7.12 | 13 |
| **4544** | 63 | < .1 | | 121.7 | | | | |
| **4546** | 37 | < .1 | | 124 | | | | |
| **4548** | 55 | < .1 | | 164.5 | | | | |
| **4549** | 37 | < .1 | 10.41 | 123.4 | 3 | 0.2 | 8.41 | 17 |
| **4551** | 47 | < .1 | | 147.8 | | | | |
| **4552** | 59 | < .1 | | 426.1 | | 0.4 | 6.86 | 32 |
| **4553** | 42 | < .1 | | 134.2 | | | | |
| **4554** | 34 | < .1 | 10.93 | 134.2 | 2.8 | 0.3 | 9.23 | 19 |
| **4555** | 40 | < .1 | | 411.7 | | 0.3 | 7.01 | 21 |
| **4556** | 35 | < .1 | | 119.8 | | | | |
| **4557** | 53 | < .1 | | 259.4 | | | | |
| **4558** | 37 | < .1 | 10.73 | 143.5 | 2.9 | 0.2 | 8.77 | 15 |
| **4559** | 45 | < .1 | | 132.3 | | | | |
| **4560** | 54 | < .1 | | 122.8 | | | | |
| **4561** | 46 | < .1 | | 119.6 | | | | |
| **4562** | 49 | < .1 | 11.31 | 144.1 | 2.9 | 0.3 | 8.72 | 18 |
| **4563** | 51 | < .1 | | 162.6 | | | | |
| **4564** | 49 | < .1 | | 145.6 | | | | |
| **4565** | 50 | < .1 | | 159.5 | | | | |
| **4566** | 62 | < .1 | 13.32 | 167.4 | 2.8 | 0.2 | 8.28 | 21 |
| **4568** | 79 | < .1 | | 166.1 | | | | |
| **4569** | 46 | < .1 | | 40.8 | | | | |
| **4572** | 65 | < .1 | | 102.5 | | | | |
| **4573** | 64 | < .1 | 12.57 | 146.2 | 3.2 | 0.3 | 7.78 | 17 |
| **4574** | 60 | < .1 | | 192.4 | | | | |
| **4575** | 57 | < .1 | | 133.4 | | | | |
| **4576** | 36 | < .1 | | 123.1 | | | | |
| **4577** | 59 | 0.3 | 31.38 | 137.3 | 3.9 | 0.2 | 7.49 | 13 |
| **4578** | 44 | < .1 | | 154.9 | | | | |
| **4580** | 51 | < .1 | | 155.6 | | | | |
| **4581** | 43 | < .1 | | 137.3 | | | | |
| **4582** | 47 | < .1 | 12.5 | 122 | 4 | 0.3 | 7.78 | 38 |

| **Element** | **Au** | **Ba** | **Be** | **Bi** | **Ca** | **Cd** | **Ce** | **Co** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **1** | **1** | **0.1** | **0.01** | **0.1** | **1** | **1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **ppm** |
| **4543** | < .1 | 212 | 1 | 0.2 | 8.72 | 1.7 | 52 | 12 |
| **4549** | < .1 | 121 | 2 | 0.3 | 3.51 | 0.8 | 57 | 16 |
| **4552** | < .1 | 83 | 2 | 0.3 | 2.87 | 2.6 | 61 | 19 |
| **4554** | < .1 | 91 | 1 | 0.3 | 2.78 | 1.1 | 68 | 17 |
| **4555** | < .1 | 182 | 3 | 0.3 | 3.9 | 1.5 | 67 | 15 |
| **4558** | < .1 | 115 | 1 | 0.3 | 1.69 | 1.2 | 64 | 15 |
| **4562** | < .1 | 185 | 2 | 0.3 | 2.96 | 0.7 | 62 | 14 |
| **4566** | < .1 | 191 | 1 | 0.2 | 7.92 | 1.2 | 62 | 13 |
| **4573** | < .1 | 168 | 1 | 0.3 | 4.89 | 1.4 | 62 | 15 |
| **4577** | < .1 | 164 | 1 | 0.3 | 3.14 | 0.9 | 76 | 13 |
| **4582** | < .1 | 54 | < 1 | 0.4 | 2.02 | 0.9 | 62 | 19 |

| **Element** | **Cr** | **Cu** | **Fe** | **Hf** | **K** | **La** | **Li** | **Mg** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **0.01** | **0.1** | **0.01** | **0.1** | **0.1** | **0.01** |
| **Samples** | **ppm** | **ppm** | **%** | **ppm** | **%** | **ppm** | **ppm** | **%** |
| **4543** | 80.5 | 39.6 | 2.68 | 1.8 | 1.7 | 30.2 | 40.1 | 1.14 |
| **4549** | 97.2 | 36.8 | 4.08 | 2.1 | 2.13 | 32.5 | 59.5 | 0.99 |
| **4552** | 113.6 | 52.4 | 5.4 | 2.4 | 2.02 | 37.8 | 69.4 | 0.78 |
| **4554** | 105.9 | 47.1 | 4.74 | 2.3 | 2.33 | 37.1 | 66.5 | 0.91 |
| **4555** | 115 | 36.5 | 4.24 | 2.2 | 2.19 | 37.8 | 64.9 | 0.78 |
| **4558** | 102 | 39.9 | 4.17 | 2.4 | 2.22 | 35.4 | 62.7 | 0.99 |
| **4562** | 103.4 | 37.5 | 3.98 | 2.3 | 2 | 33.8 | 80.3 | 0.69 |
| **4566** | 88.6 | 35.9 | 3.77 | 1.8 | 1.79 | 36 | 60.1 | 0.94 |
| **4573** | 95.8 | 47.4 | 3.7 | 1.9 | 1.91 | 35.4 | 61.1 | 0.58 |
| **4577** | 85.5 | 37.4 | 3.7 | 1.8 | 1.7 | 42.1 | 65.5 | 0.84 |
| **4582** | 96.2 | 49 | 4.94 | 2.2 | 1.78 | 33.1 | 77.5 | 0.57 |

| **Element** | **Mn** | **Mo** | **Na** | **Nb** | **Ni** | **P** | **Pb** | **Rb** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **1** | **0.1** | **0.001** | **0.1** | **0.1** | **0.001** | **0.1** | **0.1** |
| **Samples** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **4543** | 87 | 15.4 | 0.325 | 10.7 | 49.4 | 0.075 | 15.6 | 98.2 |
| **4549** | 104 | 4.9 | 0.386 | 12.1 | 44.3 | 0.083 | 17.7 | 100.2 |
| **4552** | 107 | 11 | 0.374 | 10.4 | 82.2 | 0.081 | 17.3 | 120.4 |
| **4554** | 118 | 4.8 | 0.446 | 12.9 | 55.2 | 0.084 | 20.8 | 121.1 |
| **4555** | 83 | 3.9 | 0.372 | 11.2 | 48.4 | 0.075 | 18.3 | 117.8 |
| **4558** | 143 | 12.7 | 0.407 | 12.4 | 61.4 | 0.08 | 18.5 | 116.6 |
| **4562** | 95 | 11.8 | 0.431 | 11.7 | 55.7 | 0.074 | 17.7 | 100.6 |
| **4566** | 111 | 28.9 | 0.364 | 9.8 | 50.6 | 0.071 | 13.6 | 109.6 |
| **4573** | 113 | 31 | 0.424 | 12.1 | 63.7 | 0.078 | 17.5 | 105.2 |
| **4577** | 158 | 22.5 | 0.461 | 10.6 | 57.2 | 0.217 | 18.5 | 96.7 |
| **4582** | 123 | 28.5 | 0.423 | 11.4 | 65.5 | 0.078 | 21 | 105.8 |

| **Element** | **S** | **Sb** | **Sc** | **Sn** | **Sr** | **Ta** | **Th** | **Ti** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **1** | **0.1** | **1** | **0.1** | **0.1** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **4543** | 2 | 2.2 | 9 | 1.4 | 357 | 0.6 | 7.3 | 0.312 |
| **4549** | 3.3 | 1.6 | 11 | 1.7 | 239 | 0.8 | 8.3 | 0.372 |
| **4552** | 4.5 | 2.1 | 11 | 2.3 | 172 | 0.8 | 9.7 | 0.403 |
| **4554** | 3.8 | 1.5 | 12 | 2.4 | 223 | 0.9 | 9.5 | 0.393 |
| **4555** | 3.1 | 1.4 | 14 | 2.4 | 224 | 0.8 | 10.9 | 0.394 |
| **4558** | 2.9 | 2 | 11 | 1.9 | 190 | 0.8 | 9.4 | 0.365 |
| **4562** | 2.6 | 1.6 | 11 | 2.2 | 238 | 0.9 | 9.2 | 0.403 |
| **4566** | 2.5 | 1.6 | 12 | 1.8 | 330 | 0.7 | 8.3 | 0.365 |
| **4573** | 2.7 | 2.5 | 11 | 2 | 224 | 0.8 | 8.4 | 0.375 |
| **4577** | 2.4 | 1.7 | 11 | 2 | 225 | 0.7 | 9.1 | 0.341 |
| **4582** | 3.9 | 2.1 | 11 | 2.1 | 196 | 0.8 | 9.2 | 0.384 |

| | | | | | | | ***Analysis: GROUP 4B - REE - 0.200 GM*** | |
|---|---|---|---|---|---|---|---|---|
| **Element** | **U** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ce** | **Co** |
| **LDL** | **0.1** | **1** | **0.1** | **0.1** | **1** | **0.1** | **0.5** | **0.5** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **4543** | 5.8 | 291 | 1 | 13.2 | 149 | 58.1 | 56 | 11.1 |
| **4549** | 3.4 | 227 | 1.3 | 14.7 | 132 | 69.4 | 67.8 | 13.4 |
| **4552** | 4.5 | 272 | 1.2 | 16.5 | 431 | 68.1 | 72.8 | 17.6 |
| **4554** | 3.5 | 232 | 1.3 | 16.6 | 154 | 70 | 79.5 | 13.7 |
| **4555** | 3.3 | 228 | 1.1 | 17.9 | 404 | 66.4 | 82.1 | 15.9 |
| **4558** | 5.7 | 252 | 1.1 | 15.3 | 160 | 73.3 | 77.9 | 14.6 |
| **4562** | 5.2 | 254 | 1.1 | 17.2 | 154 | 75.4 | 80.6 | 14.5 |
| **4566** | 10.2 | 248 | 1 | 17.7 | 175 | 61.6 | 67.1 | 12.5 |
| **4573** | 9.7 | 298 | 1.2 | 16.4 | 157 | 66.9 | 71.8 | 13.6 |
| **4577** | 19.7 | 215 | 1.6 | 30.2 | 142 | 61.3 | 86.6 | 13 |
| **4582** | 11.1 | 229 | 1 | 17.6 | 133 | 74.9 | 69.8 | 14.9 |

| **Element** | **Cs** | **Dy** | **Er** | **Eu** | **Ga** | **Gd** | **Hf** | **Ho** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.05** | **0.05** | **0.05** | **0.5** | **0.05** | **0.5** | **0.05** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **4543** | 7 | 3.18 | 1.86 | 0.94 | 15.8 | 3.59 | 2.7 | 0.65 |
| **4549** | 9.3 | 3.37 | 2.07 | 0.88 | 18.7 | 3.82 | 3.5 | 0.75 |
| **4552** | 8.7 | 3.72 | 2.26 | 1.02 | 18.1 | 3.88 | 3.9 | 0.67 |
| **4554** | 9.7 | 4.45 | 2.51 | 1.16 | 21.6 | 4.64 | 3.8 | 0.91 |
| **4555** | 10 | 4.58 | 2.54 | 1.21 | 21.7 | 4.93 | 3.4 | 0.89 |
| **4558** | 9.4 | 4.65 | 2.54 | 1.16 | 21.2 | 4.39 | 3.7 | 0.92 |
| **4562** | 8.9 | 4.71 | 2.76 | 1.18 | 20.8 | 4.79 | 4.5 | 0.96 |
| **4566** | 7.5 | 4.05 | 2.3 | 1.03 | 17.7 | 4.49 | 2.6 | 0.81 |
| **4573** | 8.6 | 4.33 | 2.63 | 1.13 | 18.2 | 4.55 | 3.5 | 0.9 |
| **4577** | 7.5 | 7.62 | 3.94 | 1.88 | 18.4 | 7.81 | 4.4 | 1.43 |
| **4582** | 7.9 | 4.44 | 2.81 | 1.05 | 17.9 | 5.09 | 4.4 | 0.88 |

| **Element** | **La** | **Lu** | **Nb** | **Nd** | **Pr** | **Sn** | **Rb** | **Sm** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.5** | **0.01** | **0.5** | **0.4** | **0.02** | **1** | **0.5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **4543** | 28.4 | 0.3 | 13.4 | 24 | 6.48 | 2 | 101.2 | 4.4 |
| **4549** | 35.2 | 0.37 | 15 | 29.7 | 7.84 | < 1 | 127.3 | 4.8 |
| **4552** | 37.5 | 0.37 | 14.7 | 28.7 | 8.36 | < 1 | 130.4 | 4.8 |
| **4554** | 38.6 | 0.41 | 16.7 | 33.2 | 9.28 | < 1 | 137.8 | 6 |
| **4555** | 39.9 | 0.38 | 15.2 | 36 | 9.27 | < 1 | 137.2 | 6.6 |
| **4558** | 38.2 | 0.38 | 15.7 | 33.7 | 9.23 | < 1 | 144 | 6.4 |
| **4562** | 36.8 | 0.39 | 16.5 | 34.7 | 9.17 | 1 | 129.1 | 6 |
| **4566** | 31.5 | 0.36 | 12.9 | 27.9 | 7.71 | < 1 | 113.2 | 5.8 |
| **4573** | 33.5 | 0.37 | 16 | 27.8 | 8.25 | < 1 | 121.9 | 5.8 |
| **4577** | 41.1 | 0.47 | 14.2 | 40.6 | 10.65 | < 1 | 110.3 | 9 |
| **4582** | 34.1 | 0.4 | 15.2 | 30.5 | 8.08 | < 1 | 117.1 | 6.1 |

| **Element** | **Sr** | **Ta** | **Tb** | **Th** | **Tm** | **U** | **V** | **W** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.5** | **0.1** | **0.01** | **0.1** | **0.05** | **0.1** | **5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **4543** | 331 | 0.7 | 0.54 | 9.4 | 0.28 | 6.8 | 303 | 1.1 |
| **4549** | 217.7 | 1 | 0.6 | 9.6 | 0.36 | 4.2 | 228 | 1.5 |
| **4552** | 219.8 | 0.9 | 0.63 | 11.8 | 0.31 | 5 | 275 | 1.4 |
| **4554** | 215.4 | 1 | 0.81 | 11.9 | 0.39 | 4.7 | 231 | 1.5 |
| **4555** | 270 | 0.9 | 0.72 | 14 | 0.43 | 4.4 | 222 | 1.6 |
| **4558** | 199.1 | 1 | 0.76 | 13.1 | 0.38 | 7.3 | 260 | 1.5 |
| **4562** | 239.4 | 1 | 0.77 | 10.7 | 0.45 | 6.2 | 261 | 1.5 |
| **4566** | 306.1 | 0.7 | 0.7 | 7.9 | 0.38 | 11.4 | 248 | 1.3 |
| **4573** | 224.4 | 0.9 | 0.71 | 11.3 | 0.38 | 11.7 | 303 | 1.6 |
| **4577** | 227.6 | 0.9 | 1.34 | 10.5 | 0.57 | 23.7 | 218 | 1.2 |
| **4582** | 189 | 0.9 | 0.75 | 10.7 | 0.38 | 12.3 | 219 | 1.3 |

***Analysis: GROUP 4A - 0.200 GM***

| **Element** | **Y** | **Yb** | **Zr** | **Al2O3** | **Ba** | **CaO** | **Cr2O3** | **Cr2O3** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.05** | **0.5** | **0.03** | **5** | **0.01** | **0.001** | **0.001** |
| **Samples** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **%** | **%** | **%** |
| **4543** | 20.1 | 1.84 | 95.6 | 11.71 | 761 | 14.86 | 0.011 | 0.011 |
| **4549** | 22.9 | 2.46 | 117.7 | 14.42 | 755 | 5.3 | 0.013 | 0.0126 |
| **4552** | 23.4 | 2.31 | 126.9 | 14.36 | 803.6 | 4.16 | 0.014 | |
| **4554** | 28.4 | 2.62 | 124.4 | 15.38 | 834 | 4.04 | 0.013 | 0.0133 |
| **4555** | 27.9 | 2.49 | 125.8 | 15.26 | 860.1 | 5.9 | 0.014 | |
| **4558** | 27.7 | 2.53 | 123.6 | 15.78 | 796 | 2.6 | 0.014 | 0.0139 |
| **4562** | 30.2 | 2.56 | 139.9 | 15.08 | 799 | 4.48 | 0.014 | 0.0141 |
| **4566** | 26.5 | 2.44 | 101.9 | 13.59 | 742 | 12.81 | 0.012 | 0.0124 |
| **4573** | 27.6 | 2.42 | 123 | 14.38 | 793 | 7.76 | 0.013 | 0.0132 |
| **4577** | 46.8 | 3.48 | 151.1 | 13.69 | 806 | 4.9 | 0.013 | 0.0126 |
| **4582** | 29 | 2.63 | 148.7 | 13.98 | 697 | 3.06 | 0.013 | 0.0133 |

| **Element** | **Fe2O3** | **K2O** | **LOI** | **MgO** | **MnO** | **Na2O** | **Ni** | **P2O5** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.04** | **0.04** | **0.1** | **0.01** | **0.01** | **0.01** | **30** | **0.01** |
| **Samples** | **%** | **%** | **%** | **%** | **%** | **%** | **ppm** | **%** |
| **4543** | 3.96 | 2.18 | 18.5 | 1.91 | 0.01 | 0.46 | 53 | 0.17 |
| **4549** | 5.4 | 2.6 | 15.7 | 1.67 | 0.01 | 0.53 | 49 | 0.2 |
| **4552** | 7.39 | 2.51 | 17.2 | 1.51 | 0.01 | 0.55 | 69 | 0.2 |
| **4554** | 6.01 | 2.76 | 15 | 1.52 | 0.01 | 0.57 | 43 | 0.21 |
| **4555** | 6.03 | 2.75 | 14.3 | 1.6 | 0.01 | 0.59 | 40 | 0.18 |
| **4558** | 5.47 | 2.84 | 14.4 | 1.69 | 0.02 | 0.56 | 31 | 0.22 |
| **4562** | 5.51 | 2.53 | 13 | 1.25 | 0.01 | 0.6 | 43 | 0.19 |
| **4566** | 5.22 | 2.33 | 18.2 | 1.61 | 0.01 | 0.5 | 68 | 0.19 |
| **4573** | 4.78 | 2.55 | 16.5 | 1.12 | 0.01 | 0.62 | 49 | 0.21 |
| **4577** | 5.04 | 2.33 | 13.9 | 1.45 | 0.02 | 0.67 | 38 | 0.55 |
| **4582** | 6.56 | 2.37 | 19.4 | 1.03 | 0.02 | 0.6 | 37 | 0.21 |

|  |  |  |  |  |  |  | ***Analysis: CO2*** |  |
|---|---|---|---|---|---|---|---|---|
| **Element** | **Sc** | **SiO2** | **TiO2** | **TOT/C** | **TOT/S** | **SUM** | **C/ORG** | **C/GRA** |
| **LDL** | **1** | **0.02** | **0.01** | **0.01** | **0.01** |  |  |  |
| **Samples** | **ppm** | **%** | **%** | **%** | **%** | **%** | **%** | **%** |
| **4543** | 11 | 45.55 | 0.53 | 6.9 | 1.9 | 99.95 | 3.89 | 0.16 |
| **4549** | 13 | 53.02 | 0.66 | 5.43 | 3.14 | 99.62 | 4.26 | 0.07 |
| **4552** | 13 | 50.99 | 0.67 | 5.79 | 5.1 | 99.58 | 5.01 | 0.04 |
| **4554** | 14 | 53.2 | 0.7 | 4.65 | 3.57 | 99.51 | 3.93 | 0.03 |
| **4555** | 15 | 52.28 | 0.7 | 4.65 | 3.61 | 99.62 | 3.52 | 0.03 |
| **4558** | 14 | 55.11 | 0.7 | 4.66 | 2.98 | 99.49 | 4.11 | 0.02 |
| **4562** | 14 | 56.01 | 0.75 | 3.93 | 2.74 | 99.52 | 3.06 | 0.04 |
| **4566** | 15 | 44.78 | 0.62 | 6.8 | 2.43 | 99.96 | 4.37 | 0.04 |
| **4573** | 15 | 50.94 | 0.7 | 6.49 | 3.09 | 99.68 | 5.1 | 0.03 |
| **4577** | 13 | 56.22 | 0.67 | 5.41 | 2.45 | 99.55 | 4.45 | < .02 |
| **4582** | 14 | 51.55 | 0.71 | 5.23 | 3.74 | 99.58 | 4.93 | 0.06 |

| **Element** | **CO2** | **SO4** |
|---|---|---|
| **LDL** |  |  |
| **Samples** | **%** | **%** |
| **4543** | 10.45 | 3.04 |
| **4549** | 4 | 3.6 |
| **4552** | 2.71 | 4.36 |
| **4554** | 2.53 | 3.42 |
| **4555** | 4.03 | 4.55 |
| **4558** | 1.94 | 2.43 |
| **4562** | 3.03 | 3.58 |
| **4566** | 8.78 | 4.49 |
| **4573** | 5 | 3.26 |
| **4577** | 3.48 | 2.7 |
| **4582** | 0.92 | 4.54 |

| Samples | Hole | Latitude | Longitude | From (m) | To (m) | Analysis Date |
|---|---|---|---|---|---|---|
| **4583** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1285.500 | 1285.510 | Dec. 2003 |
| **4584** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1286.500 | 1286.510 | Dec. 2003 |
| **4586** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1287.500 | 1287.510 | Dec. 2003 |
| **4587** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1288.500 | 1288.510 | Dec. 2003 |
| **4588** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1289.500 | 1289.510 | Dec. 2003 |
| **6002** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1290.500 | 1290.510 | Dec. 2003 |
| **6003** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1291.500 | 1291.510 | Dec. 2003 |
| **6004** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1292.500 | 1292.510 | Dec. 2003 |
| **6005** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1293.500 | 1293.510 | Dec. 2003 |
| **6006** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1294.500 | 1294.510 | Dec. 2003 |
| **6007** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1295.500 | 1295.510 | Dec. 2003 |
| **6008** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1296.550 | 1296.510 | Dec. 2003 |
| **6009** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1297.500 | 1297.510 | Dec. 2003 |
| **6010** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1298.500 | 1298.510 | Dec. 2003 |
| **6012** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1299.500 | 1299.510 | Dec. 2003 |
| **6013** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1300.500 | 1300.510 | Dec. 2003 |
| **6015** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1301.895 | 1302.100 | Dec. 2003 |
| **6016** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1302.500 | 1302.510 | Dec. 2003 |
| **6017** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1303.500 | 1303.510 | Dec. 2003 |
| **6018** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1305.415 | 1305.545 | Dec. 2003 |
| **6020** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1304.500 | 1304.510 | Dec. 2003 |
| **6021** | 00/05-10-051-04W5/0 | 53.386385 | -114.514664 | 1305.500 | 1305.510 | Dec. 2003 |
| **6022** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 409.330 | 409.400 | Dec. 2003 |
| **6022** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 409.330 | 409.400 | April 2004 |
| **6026** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 410.440 | 410.510 | Dec. 2003 |
| **6027** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 411.480 | 411.550 | Dec. 2003 |
| **6027** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 411.480 | 411.550 | April 2004 |
| **6029** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 412.295 | 412.365 | Dec. 2003 |
| **6030** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 413.380 | 413.450 | Dec. 2003 |
| **6030** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 413.380 | 413.450 | April 2004 |
| **6032** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 414.415 | 414.485 | Dec. 2003 |
| **6033** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 415.340 | 415.410 | Dec. 2003 |
| **6033** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 415.340 | 415.410 | April 2004 |
| **6035** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 416.320 | 416.390 | Dec. 2003 |
| **6036** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 417.330 | 417.400 | Dec. 2003 |
| **6036** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 417.330 | 417.400 | April 2004 |
| **6037** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 418.360 | 418.430 | Dec. 2003 |
| **6038** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 459.430 | 459.500 | Dec. 2003 |
| **6040** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 460.150 | 460.250 | Dec. 2003 |
| **6042** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 460.480 | 460.550 | Dec. 2003 |
| **6043** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 461.500 | 461.570 | Dec. 2003 |
| **6044** | 00/10-22-047-03W4/0 | 53.070258 | -110.352306 | 462.500 | 462.570 | Dec. 2003 |
| **6061** | 7AS01 | 57.49326 | -111.97092 | 11.400 | 11.540 | Dec. 2003 |
| **6063** | 7AS01 | 57.49326 | -111.97092 | 12.340 | 12.440 | Dec. 2003 |
| **6065** | 7AS01 | 57.49326 | -111.97092 | 13.340 | 13.460 | Dec. 2003 |
| **6067** | 7AS01 | 57.49326 | -111.97092 | 14.340 | 14.460 | Dec. 2003 |
| **6069** | 7AS01 | 57.49326 | -111.97092 | 15.390 | 15.490 | Dec. 2003 |
| **6070** | 7AS01 | 57.49326 | -111.97092 | 16.290 | 16.420 | Dec. 2003 |
| **6088** | 7BK03 | 57.73145 | -111.87704 | 72.430 | 72.530 | Dec. 2003 |

| **Samples** | **Probability of Fm** | **Formation** | **Sample Description** |
|---|---|---|---|
| 4583 | Unknown | Second White Specks | Dk grey shale, micas, white specks |
| 4584 | Unknown | Second White Specks | Dk grey shale, micas, silt |
| 4586 | Unknown | Second White Specks | Dk grey shale, fish fragments, micas |
| 4587 | Unknown | Second White Specks | Dk grey shale, silt, micas |
| 4588 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, white specks, fish remains, silt |
| 6002 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, fish fragments, micas |
| 6003 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, smooth |
| 6004 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, small sample |
| 6005 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, a few specks, some silt |
| 6006 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, fissile, a few white specks |
| 6007 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, fragments of shale, a few specks |
| 6008 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, fish fragment, silt |
| 6009 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, a few specks, some silt |
| 6010 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, a few specks, small sample |
| 6012 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, shelly debris, white specks |
| 6013 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, white specks, fissile |
| 6015 | Unknown | Belle Fourche (or underlying unit) | Breccia with calcite infilling cracks/voids |
| 6016 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, micas |
| 6017 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, fissile, a few white specks |
| 6018 | Unknown | Belle Fourche (or underlying unit) | Breccia with calcite infilling cracks/voids |
| 6020 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, some specks and silt |
| 6021 | Unknown | Belle Fourche (or underlying unit) | Dk grey shale, fragments of shale, a few specks |
| 6022 | Known | Belle Fourche (or underlying unit) | Dk grey shale, very mica rich, silty, brown fragments |
| 6022 | Known | Belle Fourche (or underlying unit) | Dk grey shale, very mica rich, silty, brown fragments |
| 6026 | Known | Belle Fourche (or underlying unit) | Dk grey shale with sand lams, silty |
| 6027 | Known | Belle Fourche (or underlying unit) | Dk grey shale with sand lams/pockets |
| 6027 | Known | Belle Fourche (or underlying unit) | Dk grey shale with sand lams/pockets |
| 6029 | Known | Belle Fourche (or underlying unit) | Dk grey shale with sand lams, silty lams |
| 6030 | Known | Belle Fourche (or underlying unit) | Dk grey shale with sand lams, some silt, brown fragments - fish fragments? |
| 6030 | Known | Belle Fourche (or underlying unit) | Dk grey shale with sand lams, some silt, brown fragments - fish fragments? |
| 6032 | Known | Belle Fourche (or underlying unit) | Dk grey shale with sand lams, silty |
| 6033 | Known | Belle Fourche (or underlying unit) | Dk grey shale with sand lams, silt, micas |
| 6033 | Known | Belle Fourche (or underlying unit) | Dk grey shale with sand lams, silt, micas |
| 6035 | Known | Belle Fourche (or underlying unit) | Dk grey shale with sand lams, lots of shelly debris |
| 6036 | Known | Belle Fourche (or underlying unit) | Dk grey shale with sand lams, and silty lams |
| 6036 | Known | Belle Fourche (or underlying unit) | Dk grey shale with sand lams, and silty lams |
| 6037 | Known | Belle Fourche (or underlying unit) | Dk grey shale with sand lams, very fissile |
| 6038 | Known | Carlile (or overlying shale) | Med grey shale with broken fragments, smooth |
| 6040 | Known | Carlile (or overlying shale) | Dk grey shale, with a silty/light coloured layer (bentonite? Burt?) |
| 6042 | Known | Carlile (or overlying shale) | Dk grey shale, very smooth, a few rust coloured spots |
| 6043 | Known | Carlile (or overlying shale) | Dk grey shale, very smooth |
| 6044 | Known | Carlile (or overlying shale) | Dk grey shale, micas, silty |
| 6061 | Unknown | Second White Specks | Dk grey shale, thin bentonite, shells |
| 6063 | Unknown | Second White Specks | Dk grey shale, broken fragments, some silt |
| 6065 | Unknown | Second White Specks | Dk grey shale, some silt |
| 6067 | Unknown | Second White Specks | Dk grey shale, very silty, a few micas |
| 6069 | Unknown | Second White Specks | Dk grey shale fragments, silty |
| 6070 | Unknown | Second White Specks | Dk grey shale fragments, some silt |
| 6088 | Unknown | Labiche | Shale above SWS, light grey, silty |

***Analysis: GROUP 1F1 - 1.00 GM***

| **Element** | **Ag** | **Al** | **As** | **Au** | **B** | **Ba** | **Be** | **Bi** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** | **0.1** | **0.02** |
| **Samples** | **ppb** | **%** | **ppm** | **ppb** | **ppm** | **ppm** | **ppm** | **ppm** |
| **4583** | 313 | 1.09 | 36.8 | 0.5 | 15 | 38.1 | | 0.32 |
| **4584** | 300 | 1.03 | 29.3 | 0.5 | 13 | 43.9 | | 0.33 |
| **4586** | 286 | 1.04 | 28.8 | 1.1 | 15 | 36.8 | | 0.28 |
| **4587** | 243 | 0.96 | 28 | 0.6 | 15 | 59.7 | 0.6 | 0.38 |
| **4588** | 197 | 1.01 | 20.6 | 0.7 | 14 | 67.4 | | 0.31 |
| **6002** | 248 | 1.19 | 25.9 | 0.7 | 12 | 47.5 | | 0.34 |
| **6003** | 254 | 1.14 | 26.9 | < .2 | 12 | 47.7 | | 0.37 |
| **6004** | 226 | 1.02 | 22.6 | 0.4 | 14 | 65.5 | 0.6 | 0.36 |
| **6005** | 310 | 1.25 | 29.7 | 0.8 | 14 | 40.8 | | 0.39 |
| **6006** | 268 | 1.13 | 28 | 0.8 | 13 | 43.8 | | 0.4 |
| **6007** | 279 | 1.32 | 25.2 | 0.5 | 16 | 52.7 | | 0.41 |
| **6008** | 303 | 1.4 | 19.7 | 0.5 | 18 | 94.3 | 0.9 | 0.45 |
| **6009** | 326 | 1.17 | 23.3 | 0.7 | 16 | 62.2 | | 0.45 |
| **6010** | 373 | 1.7 | 23 | 0.7 | 17 | 73.9 | | 0.48 |
| **6012** | 447 | 1.31 | 28 | 0.9 | 14 | 56.7 | | 0.49 |
| **6013** | 407 | 1.42 | 23.4 | 2.8 | 14 | 67.4 | 1 | 0.45 |
| **6015** | 53 | 0.36 | 5.2 | < .2 | 6 | 316.4 | | 0.07 |
| **6016** | 335 | 1.42 | 25.4 | 0.8 | 15 | 57.9 | | 0.45 |
| **6017** | 337 | 1.62 | 24.8 | 0.2 | 19 | 68.9 | | 0.43 |
| **6018** | 86 | 0.36 | 5.4 | < .2 | 8 | 496.1 | | 0.07 |
| **6020** | 283 | 1.27 | 20.3 | 0.7 | 14 | 89.1 | 1.5 | 0.37 |
| **6021** | 332 | 1.56 | 22.5 | 0.7 | 16 | 60.2 | | 0.39 |
| **6022** | 96 | 1.17 | 23.8 | 0.9 | 17 | 160.2 | | 0.45 |
| **6026** | 86 | 1 | 26.1 | 2.2 | 15 | 163.9 | | 0.33 |
| **6027** | 144 | 0.94 | 14.3 | 0.9 | 14 | 174.7 | | 0.3 |
| **6029** | 102 | 1.02 | 25.5 | 0.7 | 14 | 92 | | 0.33 |
| **6030** | 118 | 1.08 | 27.4 | 0.6 | 16 | 176 | | 0.39 |
| **6032** | 169 | 1.02 | 18.4 | 1.8 | 15 | 132.8 | | 0.32 |
| **6033** | 177 | 0.88 | 16.8 | 1.8 | 14 | 115.7 | | 0.28 |
| **6035** | 506 | 1.05 | 33.3 | 1.8 | 16 | 32.3 | | 0.56 |
| **6036** | 466 | 0.92 | 34.8 | 2 | 15 | 31.5 | | 0.5 |
| **6037** | 411 | 0.97 | 23.2 | 1.3 | 12 | 41.1 | | 0.46 |
| **6038** | 158 | 1.04 | 5.1 | 0.3 | 18 | 211.5 | 1.1 | 1.03 |
| **6040** | 101 | 0.97 | 6.6 | 0.6 | 10 | 225.4 | | 0.29 |
| **6042** | 179 | 0.92 | 6.1 | < .2 | 14 | 176.5 | | 0.58 |
| **6043** | 173 | 0.97 | 7.8 | 0.8 | 16 | 186.4 | 1.9 | 0.57 |
| **6044** | 207 | 0.8 | 47.6 | 0.7 | 14 | 69 | | 0.36 |
| **6061** | 820 | 0.91 | 46.9 | 1.8 | 21 | 71.9 | | 0.41 |
| **6063** | 668 | 0.73 | 49.3 | 1.8 | 17 | 66.1 | | 0.34 |
| **6065** | 638 | 1.07 | 60.4 | 2.6 | 17 | 81.1 | | 0.34 |
| **6067** | 848 | 1.4 | 59.2 | 3.1 | 22 | 77.3 | | 0.4 |
| **6069** | 943 | 1.71 | 45 | 2.6 | 32 | 91.2 | | 0.37 |
| **6070** | 1283 | 1.28 | 29.1 | 6.2 | 25 | 105.9 | | 0.54 |
| **6088** | 87 | 1.08 | 24.6 | 0.3 | 17 | 192.6 | | 0.31 |

| **Element** | **Ca** | **Cd** | **Ce** | **Co** | **Cr** | **Cs** | **Cu** | **Fe** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **0.01** | **0.1** | **0.1** | **0.5** | **0.02** | **0.01** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **4583** | 2.24 | 1.44 | | 15.9 | 21.1 | | 42.49 | 3.77 |
| **4584** | 0.69 | 0.9 | | 14.7 | 21.4 | | 42.13 | 3.15 |
| **4586** | 2.13 | 0.78 | | 13.2 | 20.6 | | 36.1 | 3.31 |
| **4587** | 1.37 | 0.74 | 16.7 | 14.5 | 19.7 | 1.58 | 38.19 | 3.53 |
| **4588** | 2.31 | 0.52 | | 12 | 20.3 | | 33.54 | 3.72 |
| **6002** | 1.8 | 0.97 | | 14.6 | 22.3 | | 36.54 | 4.71 |
| **6003** | 0.46 | 0.83 | | 14.1 | 21.5 | | 38.28 | 3.12 |
| **6004** | 1.38 | 0.59 | 15.7 | 13.8 | 18.7 | 1.71 | 36.61 | 3.66 |
| **6005** | 0.82 | 0.99 | | 15.3 | 21.6 | | 38.29 | 3.71 |
| **6006** | 1.04 | 1.13 | | 15.1 | 19.3 | | 40.73 | 3.05 |
| **6007** | 0.72 | 1.1 | | 16.2 | 22.3 | | 43.36 | 3.06 |
| **6008** | 0.38 | 1.17 | 15.1 | 15.6 | 22.2 | 2.09 | 42.04 | 2.66 |
| **6009** | 0.41 | 1.36 | | 16.3 | 20.7 | | 46.02 | 2.79 |
| **6010** | 0.32 | 0.89 | | 16.4 | 28.4 | | 60.21 | 3.09 |
| **6012** | 0.36 | 1.6 | | 18 | 24.3 | | 61.39 | 3.12 |
| **6013** | 0.29 | 1.28 | 18.4 | 17.8 | 25.8 | 1.85 | 66.39 | 3.32 |
| **6015** | 24.46 | 0.17 | | 2.8 | 6.9 | | 8.78 | 2.27 |
| **6016** | 0.67 | 1.39 | | 17 | 26.2 | | 53.39 | 3.14 |
| **6017** | 1.06 | 1.25 | | 15.6 | 28.8 | | 53.52 | 4.04 |
| **6018** | 22.08 | 0.24 | | 3.2 | 7.4 | | 10.26 | 1.91 |
| **6020** | 0.5 | 0.66 | 14.2 | 14.3 | 21 | 1.87 | 43.37 | 2.59 |
| **6021** | 0.23 | 1.04 | | 16.1 | 26.1 | | 47.17 | 2.87 |
| **6022** | 0.36 | 0.17 | | 10.7 | 15.8 | | 35.12 | 2.12 |
| **6026** | 0.54 | 0.06 | | 8.9 | 20.2 | | 33.45 | 1.94 |
| **6027** | 1.17 | 0.42 | | 8.9 | 20 | | 33.95 | 1.94 |
| **6029** | 0.49 | 0.09 | | 8.8 | 19.6 | | 36.36 | 2.71 |
| **6030** | 1.92 | 0.12 | | 8.9 | 19.3 | | 38.51 | 2.15 |
| **6032** | 0.33 | 0.42 | | 9.4 | 20.1 | | 42.18 | 2.2 |
| **6033** | 0.8 | 0.47 | | 9.1 | 16.2 | | 39.55 | 1.86 |
| **6035** | 1.49 | 1.17 | | 13.4 | 14.4 | | 66.12 | 3.79 |
| **6036** | 0.5 | 1.23 | | 13.9 | 13.8 | | 60 | 3.91 |
| **6037** | 0.72 | 0.78 | | 9.7 | 11.1 | | 56.26 | 2.94 |
| **6038** | 0.24 | 2.19 | 64.6 | 7.4 | 4.9 | 0.77 | 31.19 | 1.16 |
| **6040** | 2.52 | 1.37 | | 7 | 10.9 | | 22.41 | 16.43 |
| **6042** | 0.2 | 2.23 | | 13.2 | 10.7 | | 43.89 | 2.17 |
| **6043** | 0.29 | 1.24 | 40.1 | 11.4 | 10.3 | 1.63 | 34.08 | 2.83 |
| **6044** | 0.26 | 1.28 | | 13.7 | 9.6 | | 38.08 | 2.86 |
| **6061** | 6.75 | 13.18 | | 29.3 | 22.1 | | 92.67 | 3.3 |
| **6063** | 8.2 | 11.65 | | 24.6 | 20.5 | | 79.8 | 3.91 |
| **6065** | 7.21 | 9.35 | | 27.4 | 23.9 | | 74.4 | 3.89 |
| **6067** | 3.92 | 13.85 | | 25.2 | 29.4 | | 92.01 | 3.86 |
| **6069** | 4.89 | 13.65 | | 20.3 | 45.5 | | 93.03 | 3.46 |
| **6070** | 1.39 | 8.09 | | 16.6 | 55.9 | | 125.43 | 2.87 |
| **6088** | 0.44 | 0.47 | | 14.6 | 18.8 | | 31.65 | 2.29 |

| **Element**<br>**LDL**<br>**Samples** | **Ga**<br>**0.1**<br>**ppm** | **Ge**<br>**0.1**<br>**ppm** | **Hf**<br>**0.02**<br>**ppm** | **Hg**<br>**5**<br>**ppb** | **In**<br>**0.02**<br>**ppm** | **K**<br>**0.01**<br>**%** | **La**<br>**0.5**<br>**ppm** | **Li**<br>**0.1**<br>**ppm** |
|---|---|---|---|---|---|---|---|---|
| **4583** | 4.7 | | | 131 | | 0.3 | 7.6 | |
| **4584** | 4.4 | | | 481 | | 0.28 | 6.4 | |
| **4586** | 4.3 | | | 249 | | 0.27 | 12.1 | |
| **4587** | 4.3 | <.1 | 0.14 | 429 | 0.05 | 0.27 | 7.4 | 18.3 |
| **4588** | 4.2 | | | 245 | | 0.26 | 7.3 | |
| **6002** | 4.7 | | | 159 | | 0.3 | 7.9 | |
| **6003** | 4.6 | | | 341 | | 0.29 | 6.5 | |
| **6004** | 4.6 | <.1 | 0.15 | 176 | 0.06 | 0.28 | 7.3 | 20.3 |
| **6005** | 4.9 | | | 380 | | 0.32 | 7.8 | |
| **6006** | 4.6 | | | 123 | | 0.29 | 7 | |
| **6007** | 5.2 | | | 183 | | 0.34 | 7.5 | |
| **6008** | 5.3 | <.1 | 0.13 | 160 | 0.06 | 0.35 | 8 | 31.9 |
| **6009** | 5 | | | 247 | | 0.3 | 7.6 | |
| **6010** | 6.7 | | | 200 | | 0.42 | 10.2 | |
| **6012** | 5.4 | | | 583 | | 0.31 | 8.3 | |
| **6013** | 5.6 | <.1 | 0.18 | 566 | 0.06 | 0.36 | 7.7 | 30 |
| **6015** | 1.1 | | | 60 | | 0.09 | 3 | |
| **6016** | 5.9 | | | 257 | | 0.35 | 8.9 | |
| **6017** | 6.2 | | | 173 | | 0.41 | 9.6 | |
| **6018** | 1.1 | | | 46 | | 0.1 | 3.5 | |
| **6020** | 5.5 | <.1 | 0.12 | 139 | 0.06 | 0.34 | 6.2 | 21.1 |
| **6021** | 5.7 | | | 314 | | 0.39 | 6.8 | |
| **6022** | 5.6 | | | 363 | | 0.37 | 30.3 | |
| **6026** | 3.6 | | | 147 | | 0.26 | 19.4 | |
| **6027** | 3.6 | | | 133 | | 0.24 | 20.9 | |
| **6029** | 3.6 | | | 128 | | 0.27 | 18.7 | |
| **6030** | 4.1 | | | 133 | | 0.28 | 21.9 | |
| **6032** | 4 | | | 119 | | 0.28 | 19.2 | |
| **6033** | 3.4 | | | 178 | | 0.26 | 22.7 | |
| **6035** | 4.1 | | | 165 | | 0.23 | 30.3 | |
| **6036** | 4.1 | | | 168 | | 0.21 | 18.3 | |
| **6037** | 3.6 | | | 146 | | 0.19 | 30.7 | |
| **6038** | 3.6 | <.1 | 0.31 | 49 | 0.05 | 0.19 | 33.4 | 12.2 |
| **6040** | 3.2 | | | 54 | | 0.16 | 26.4 | |
| **6042** | 3.8 | | | 45 | | 0.22 | 25.2 | |
| **6043** | 3.6 | <.1 | 0.17 | 50 | 0.06 | 0.23 | 20.4 | 16.5 |
| **6044** | 3.1 | | | 174 | | 0.22 | 15.4 | |
| **6061** | 5.9 | | | 235 | | 0.22 | 31.3 | |
| **6063** | 4.7 | | | 257 | | 0.18 | 24.7 | |
| **6065** | 4.6 | | | 206 | | 0.21 | 61.3 | |
| **6067** | 5.7 | | | 219 | | 0.24 | 96.3 | |
| **6069** | 6.1 | | | 263 | | 0.29 | 176.8 | |
| **6070** | 5.1 | | | 357 | | 0.29 | 56.6 | |
| **6088** | 3.5 | | | 90 | | 0.25 | 13 | |

| **Element** | **Mg** | **Mn** | **Mo** | **Na** | **Nb** | **Ni** | **P** | **Pb** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **1** | **0.01** | **0.001** | **0.02** | **0.1** | **0.001** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** |
| **4583** | 0.27 | 114 | 27.83 | 0.186 |  | 53.1 | 0.078 | 15.4 |
| **4584** | 0.23 | 92 | 20.21 | 0.191 |  | 54.4 | 0.069 | 15.23 |
| **4586** | 0.5 | 149 | 16.2 | 0.168 |  | 48.1 | 0.155 | 14.46 |
| **4587** | 0.34 | 137 | 16.54 | 0.213 | 0.07 | 48.6 | 0.077 | 17.51 |
| **4588** | 0.48 | 177 | 11.67 | 0.208 |  | 43.3 | 0.068 | 14.99 |
| **6002** | 0.61 | 225 | 17.11 | 0.212 |  | 50.1 | 0.057 | 18.11 |
| **6003** | 0.28 | 100 | 14.45 | 0.238 |  | 48.9 | 0.059 | 18.17 |
| **6004** | 0.41 | 155 | 16.15 | 0.23 | 0.04 | 47.6 | 0.058 | 16.92 |
| **6005** | 0.36 | 131 | 18.13 | 0.211 |  | 54.2 | 0.069 | 18.45 |
| **6006** | 0.28 | 98 | 19.81 | 0.233 |  | 53.1 | 0.051 | 18.82 |
| **6007** | 0.31 | 108 | 20.72 | 0.254 |  | 58.1 | 0.055 | 20.31 |
| **6008** | 0.36 | 111 | 16.01 | 0.285 | 0.06 | 52.8 | 0.051 | 19.84 |
| **6009** | 0.3 | 93 | 18.51 | 0.258 |  | 58.9 | 0.06 | 22.82 |
| **6010** | 0.48 | 169 | 11.26 | 0.273 |  | 57.7 | 0.073 | 24.21 |
| **6012** | 0.38 | 126 | 17.3 | 0.277 |  | 69.5 | 0.07 | 24.44 |
| **6013** | 0.42 | 157 | 12.84 | 0.231 | 0.09 | 64.8 | 0.071 | 21.43 |
| **6015** | 1.75 | 542 | 4.83 | 0.065 |  | 8.7 | 0.066 | 4.51 |
| **6016** | 0.45 | 156 | 15.43 | 0.225 |  | 58 | 0.076 | 23.45 |
| **6017** | 0.7 | 238 | 13.06 | 0.238 |  | 53.7 | 0.075 | 21.04 |
| **6018** | 3.32 | 426 | 2.14 | 0.062 |  | 9.5 | 0.058 | 7.18 |
| **6020** | 0.35 | 109 | 6.64 | 0.31 | 0.07 | 48.3 | 0.062 | 17.64 |
| **6021** | 0.37 | 121 | 7.07 | 0.282 |  | 50.1 | 0.057 | 19.7 |
| **6022** | 0.46 | 166 | 0.87 | 0.443 |  | 25.9 | 0.111 | 24.73 |
| **6026** | 0.29 | 85 | 0.68 | 0.336 |  | 29.1 | 0.13 | 15.9 |
| **6027** | 0.28 | 124 | 1.7 | 0.325 |  | 34.6 | 0.109 | 14.55 |
| **6029** | 0.3 | 94 | 0.83 | 0.321 |  | 27.2 | 0.12 | 16.65 |
| **6030** | 0.34 | 154 | 0.86 | 0.36 |  | 27.9 | 0.13 | 18.19 |
| **6032** | 0.28 | 100 | 3.24 | 0.347 |  | 38 | 0.112 | 14.68 |
| **6033** | 0.25 | 104 | 2.96 | 0.323 |  | 34.9 | 0.139 | 12.76 |
| **6035** | 0.31 | 119 | 11.87 | 0.553 |  | 41.8 | 0.236 | 21.16 |
| **6036** | 0.28 | 114 | 11.99 | 0.549 |  | 42.6 | 0.083 | 20.75 |
| **6037** | 0.3 | 113 | 7.68 | 0.63 |  | 34.1 | 0.135 | 20.33 |
| **6038** | 0.24 | 364 | 4.88 | 1.305 | 0.09 | 46.6 | 0.026 | 27.55 |
| **6040** | 1.56 | 5609 | 1.91 | 0.395 |  | 23 | 0.67 | 10.85 |
| **6042** | 0.23 | 959 | 1.86 | 0.701 |  | 45.8 | 0.031 | 20.28 |
| **6043** | 0.23 | 1756 | 1.53 | 0.683 | 0.02 | 33.5 | 0.066 | 20.24 |
| **6044** | 0.21 | 214 | 5.62 | 0.604 |  | 49.3 | 0.079 | 15.08 |
| **6061** | 0.36 | 271 | 169.15 | 0.077 |  | 225.6 | 0.144 | 19.34 |
| **6063** | 0.34 | 220 | 134.85 | 0.065 |  | 199 | 0.094 | 15.36 |
| **6065** | 0.38 | 228 | 75.78 | 0.066 |  | 175.5 | 0.312 | 14.75 |
| **6067** | 0.51 | 201 | 42.76 | 0.104 |  | 137.7 | 0.41 | 20.94 |
| **6069** | 0.53 | 268 | 31.62 | 0.119 |  | 98.1 | 0.828 | 18.98 |
| **6070** | 0.46 | 116 | 24.52 | 0.113 |  | 84.1 | 0.262 | 20.56 |
| **6088** | 0.45 | 273 | 1.86 | 0.151 |  | 41.5 | 0.072 | 17.61 |

| **Element** | **Pd** | **Pt** | **Rb** | **Re** | **S** | **Sb** | **Sc** | **Se** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **10** | **2** | **0.1** | **1** | **0.02** | **0.02** | **0.1** | **0.1** |
| **Samples** | **ppb** | **ppb** | **ppm** | **ppb** | **%** | **ppm** | **ppm** | **ppm** |
| **4583** | | | | | 2.99 | 0.8 | 6.5 | 3.2 |
| **4584** | | | | | 2.27 | 0.94 | 3.7 | 2.9 |
| **4586** | | | | | 2.11 | 0.83 | 7.9 | 2.6 |
| **4587** | < 10 | 2 | 20.7 | 43 | 2.09 | 0.82 | 4.6 | 2.6 |
| **4588** | | | | | 1.62 | 0.59 | 8 | 2.1 |
| **6002** | | | | | 2.05 | 0.82 | 6.7 | 2.8 |
| **6003** | | | | | 2.05 | 0.87 | 4 | 2.5 |
| **6004** | < 10 | < 2 | 22.1 | 35 | 1.85 | 0.71 | 6 | 2.4 |
| **6005** | | | | | 2.49 | 0.82 | 5.1 | 2.8 |
| **6006** | | | | | 1.98 | 0.92 | 5.4 | 2.9 |
| **6007** | | | | | 1.9 | 0.9 | 5.1 | 3.1 |
| **6008** | < 10 | < 2 | 27.1 | 34 | 1.32 | 0.91 | 4 | 2.7 |
| **6009** | | | | | 1.67 | 0.84 | 4.5 | 3.1 |
| **6010** | | | | | 1.4 | 0.9 | 6.1 | 3.1 |
| **6012** | | | | | 1.92 | 1.16 | 4.8 | 4.4 |
| **6013** | < 10 | < 2 | 24.9 | 36 | 1.85 | 1.1 | 5.5 | 3.3 |
| **6015** | | | | | 0.86 | 0.27 | 2.3 | 0.8 |
| **6016** | | | | | 1.79 | 0.93 | 5.4 | 3.1 |
| **6017** | | | | | 1.47 | 0.85 | 6.9 | 3.2 |
| **6018** | | | | | 0.37 | 0.25 | 2.3 | 0.8 |
| **6020** | < 10 | < 2 | 25.4 | 13 | 1.45 | 0.75 | 4.4 | 2 |
| **6021** | | | | | 1.59 | 0.75 | 4.2 | 2.7 |
| **6022** | | | | | 0.9 | 0.61 | 3.2 | 1.7 |
| **6026** | | | | | 1.05 | 0.37 | 3.7 | 2.1 |
| **6027** | | | | | 1.05 | 0.54 | 3.8 | 2.9 |
| **6029** | | | | | 1.77 | 0.35 | 3.4 | 1.7 |
| **6030** | | | | | 1.2 | 0.42 | 4.2 | 2.2 |
| **6032** | | | | | 1.37 | 0.53 | 3.4 | 2.9 |
| **6033** | | | | | 1.75 | 0.37 | 3.7 | 3.4 |
| **6035** | | | | | 4.63 | 0.36 | 4.1 | 4.6 |
| **6036** | | | | | 4.67 | 0.34 | 2.9 | 4.6 |
| **6037** | | | | | 3.3 | 0.31 | 3.6 | 3.6 |
| **6038** | < 10 | < 2 | 11.4 | 1 | 0.11 | 0.55 | 2.3 | 1.9 |
| **6040** | | | | | 0.1 | 0.4 | 4.6 | 1.6 |
| **6042** | | | | | 0.21 | 0.33 | 4.1 | 2.7 |
| **6043** | < 10 | < 2 | 19.6 | < 1 | 0.12 | 0.43 | 4.3 | 1.8 |
| **6044** | | | | | 2.76 | 0.83 | 3.7 | 3 |
| **6061** | | | | | 4.23 | 10.84 | 3.8 | 41 |
| **6063** | | | | | 5.03 | 9.39 | 3.7 | 37.9 |
| **6065** | | | | | 4.52 | 7.32 | 5.1 | 43.4 |
| **6067** | | | | | 4.14 | 7.34 | 6.6 | 45.1 |
| **6069** | | | | | 3.58 | 6.13 | 11.1 | 38.4 |
| **6070** | | | | | 2.89 | 3.87 | 4.7 | 40.1 |
| **6088** | | | | | 0.86 | 0.78 | 4.9 | 1.7 |

| **Element** | **Sn** | **Sr** | **Ta** | **Te** | **Th** | **Ti** | **Tl** | **U** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.5** | **0.05** | **0.02** | **0.1** | **0.001** | **0.02** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **4583** | | 88.2 | | 0.08 | 4.8 | 0.001 | 0.33 | 10.55 |
| **4584** | | 63.1 | | 0.09 | 5.1 | 0.001 | 0.35 | 5.21 |
| **4586** | | 106.2 | | 0.08 | 5 | 0.001 | 0.36 | 10.12 |
| **4587** | 0.7 | 83.3 | < .05 | 0.12 | 6 | 0.003 | 0.27 | 5.48 |
| **4588** | | 103.5 | | 0.06 | 5.4 | 0.001 | 0.26 | 5.64 |
| **6002** | | 95.9 | | 0.1 | 5.7 | 0.001 | 0.34 | 6.38 |
| **6003** | | 71.2 | | 0.07 | 5.4 | 0.001 | 0.29 | 3.96 |
| **6004** | 0.9 | 88.1 | < .05 | 0.09 | 6.2 | 0.007 | 0.27 | 5.63 |
| **6005** | | 83.6 | | 0.1 | 6 | 0.001 | 0.46 | 6.29 |
| **6006** | | 82.7 | | 0.09 | 5.8 | 0.001 | 0.48 | 5.59 |
| **6007** | | 85.5 | | 0.08 | 6.1 | 0.002 | 0.47 | 5.97 |
| **6008** | 1 | 87.3 | < .05 | 0.09 | 7.1 | 0.009 | 0.51 | 3.71 |
| **6009** | | 80 | | 0.09 | 7.2 | 0.001 | 0.56 | 4.64 |
| **6010** | | 77.4 | | 0.12 | 8.2 | 0.002 | 0.34 | 3.84 |
| **6012** | | 75.6 | | 0.11 | 7.5 | 0.002 | 0.74 | 3.73 |
| **6013** | 1 | 71.2 | < .05 | 0.09 | 7.5 | 0.011 | 0.49 | 3.92 |
| **6015** | | 487.9 | | < .02 | 1.4 | < .001 | 0.09 | 1.3 |
| **6016** | | 78.7 | | 0.11 | 7.4 | 0.002 | 0.48 | 3.95 |
| **6017** | | 90.7 | | 0.07 | 7.1 | 0.002 | 0.42 | 4.11 |
| **6018** | | 822.9 | | 0.04 | 1.5 | < .001 | 0.12 | 1.16 |
| **6020** | 0.8 | 86.1 | < .05 | 0.1 | 5.9 | 0.007 | 0.41 | 2.55 |
| **6021** | | 71 | | 0.06 | 6.2 | 0.002 | 0.32 | 2.04 |
| **6022** | | 88.2 | | 0.14 | 9.9 | 0.012 | 0.21 | 5.41 |
| **6026** | | 88.7 | | 0.1 | 6.5 | 0.002 | 0.1 | 2.36 |
| **6027** | | 96.3 | | 0.07 | 7 | 0.002 | 0.32 | 3.11 |
| **6029** | | 83.9 | | 0.1 | 6.8 | 0.002 | 0.12 | 2.43 |
| **6030** | | 121.2 | | 0.11 | 7.9 | 0.003 | 0.14 | 3.01 |
| **6032** | | 84.9 | | 0.09 | 6.5 | 0.002 | 0.32 | 3.21 |
| **6033** | | 101.6 | | 0.07 | 7.2 | 0.002 | 0.3 | 4.09 |
| **6035** | | 173.9 | | 0.21 | 6.7 | 0.001 | 0.51 | 6.49 |
| **6036** | | 112.2 | | 0.16 | 7.8 | 0.001 | 0.53 | 5.34 |
| **6037** | | 143.7 | | 0.12 | 10.4 | 0.001 | 0.37 | 5.81 |
| **6038** | 3 | 187.7 | < .05 | 0.06 | 23.6 | 0.003 | 0.1 | 9.02 |
| **6040** | | 217.1 | | 0.07 | 5.8 | 0.002 | 0.06 | 2.46 |
| **6042** | | 124.1 | | 0.1 | 12 | 0.001 | 0.07 | 3.98 |
| **6043** | 1.2 | 123.4 | < .05 | 0.12 | 10.3 | 0.004 | 0.08 | 4.73 |
| **6044** | | 111.6 | | 0.08 | 6.7 | 0.001 | 0.79 | 6.21 |
| **6061** | | 188.3 | | 0.19 | 6.3 | 0.005 | 5.2 | 39.49 |
| **6063** | | 201.8 | | 0.15 | 5.3 | 0.003 | 4.54 | 30.04 |
| **6065** | | 211.5 | | 0.17 | 9.3 | 0.005 | 5.26 | 28.36 |
| **6067** | | 188.4 | | 0.21 | 14.2 | 0.005 | 5.73 | 29.7 |
| **6069** | | 270.8 | | 0.21 | 19.3 | 0.01 | 4.09 | 41.66 |
| **6070** | | 139.3 | | 0.19 | 9.7 | 0.004 | 2.34 | 14.47 |
| **6088** | | 104.4 | | 0.09 | 6.1 | 0.002 | 0.13 | 1.9 |

***Analysis: GROUP 1EX - 0.25 GM***

| **Element**<br>**LDL**<br>**Samples** | **V**<br>**2**<br>**ppm** | **W**<br>**0.1**<br>**ppm** | **Y**<br>**0.01**<br>**ppm** | **Zn**<br>**0.1**<br>**ppm** | **Zr**<br>**0.1**<br>**ppm** | **Ag**<br>**0.1**<br>**ppm** | **Al**<br>**0.01**<br>**%** | **As**<br>**1**<br>**ppm** |
|---|---|---|---|---|---|---|---|---|
| **4583** | 49 | < .1 | | 202.2 | | | | |
| **4584** | 47 | < .1 | | 134.9 | | | | |
| **4586** | 56 | < .1 | | 113.7 | | | | |
| **4587** | 47 | < .1 | 14.44 | 159 | 3.3 | 0.3 | 7.36 | 20 |
| **4588** | 61 | 0.7 | | 99 | | | | |
| **6002** | 68 | < .1 | | 142.4 | | | | |
| **6003** | 46 | < .1 | | 134.5 | | | | |
| **6004** | 55 | < .1 | 12.36 | 99.2 | 3.6 | 0.2 | 7.89 | 12 |
| **6005** | 53 | < .1 | | 130.6 | | | | |
| **6006** | 54 | < .1 | | 145 | | | | |
| **6007** | 58 | < .1 | | 131 | | | | |
| **6008** | 59 | < .1 | 9 | 128.4 | 3.8 | 0.3 | 7.83 | 12 |
| **6009** | 52 | < .1 | | 173.9 | | | | |
| **6010** | 74 | < .1 | | 137.4 | | | | |
| **6012** | 60 | < .1 | | 162.8 | | | | |
| **6013** | 59 | < .1 | 13.78 | 147.3 | 4.4 | 0.4 | 7.2 | 19 |
| **6015** | 23 | < .1 | | 24.5 | | | | |
| **6016** | 60 | < .1 | | 201.7 | | | | |
| **6017** | 81 | < .1 | | 187.9 | | | | |
| **6018** | 23 | < .1 | | 32.4 | | | | |
| **6020** | 41 | < .1 | 13.71 | 128.6 | 3.6 | 0.3 | 7.12 | 19 |
| **6021** | 53 | < .1 | | 165.4 | | | | |
| **6022** | 63 | < .1 | | 139.6 | | 0.1 | 6.96 | 23 |
| **6026** | 72 | < .1 | | 103.1 | | | | |
| **6027** | 65 | < .1 | | 108.4 | | 0.2 | 6.15 | 15 |
| **6029** | 70 | < .1 | | 93.4 | | | | |
| **6030** | 63 | < .1 | | 93.9 | | 0.1 | 6.31 | 23 |
| **6032** | 63 | < .1 | | 117.1 | | | | |
| **6033** | 56 | < .1 | | 98.5 | | 0.2 | 5.82 | 17 |
| **6035** | 33 | < .1 | | 146.4 | | | | |
| **6036** | 27 | < .1 | | 148.2 | | 0.5 | 6.28 | 36 |
| **6037** | 21 | < .1 | | 129.6 | | | | |
| **6038** | 9 | < .1 | 23.07 | 138.7 | 12.4 | 0.2 | 7.02 | 6 |
| **6040** | 24 | 0.3 | | 130.5 | | | | |
| **6042** | 15 | < .1 | | 153 | | | | |
| **6043** | 16 | < .1 | 18.48 | 117.7 | 6.8 | 0.4 | 7.37 | 8 |
| **6044** | 15 | < .1 | | 123.6 | | | | |
| **6061** | 283 | 0.2 | | 344.5 | | | | |
| **6063** | 252 | 0.1 | | 275.6 | | | | |
| **6065** | 292 | < .1 | | 275.2 | | | | |
| **6067** | 370 | < .1 | | 333 | | | | |
| **6069** | 439 | < .1 | | 304.2 | | | | |
| **6070** | 332 | < .1 | | 238.1 | | | | |
| **6088** | 39 | < .1 | | 137.6 | | | | |

| **Element** | **Au** | **Ba** | **Be** | **Bi** | **Ca** | **Cd** | **Ce** | **Co** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **1** | **1** | **0.1** | **0.01** | **0.1** | **1** | **1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **ppm** |
| **4587** | < .1 | 125 | 1 | 0.3 | 1.18 | 0.9 | 66 | 14 |
| **6004** | < .1 | 140 | 3 | 0.3 | 1.2 | 0.5 | 66 | 15 |
| **6008** | < .1 | 375 | 4 | 0.4 | 0.28 | 1.3 | 56 | 16 |
| **6013** | < .1 | 112 | 2 | 0.4 | 0.43 | 1.1 | 54 | 19 |
| **6020** | < .1 | 199 | 3 | 0.3 | 0.42 | 0.8 | 57 | 15 |
| **6022** | < .1 | 390 | 3 | 0.4 | 0.43 | 0.2 | 75 | 11 |
| **6027** | < .1 | 193 | 2 | 0.3 | 1.41 | 0.3 | 68 | 10 |
| **6030** | < .1 | 219 | 2 | 0.3 | 2.22 | 0.1 | 64 | 9 |
| **6033** | < .1 | 173 | 3 | 0.3 | 0.81 | 0.4 | 73 | 9 |
| **6036** | < .1 | 40 | 3 | 0.5 | 0.48 | 1.1 | 61 | 14 |
| **6038** | < .1 | 383 | 2 | 0.9 | 0.25 | 2.2 | 54 | 7 |
| **6043** | < .1 | 508 | 2 | 0.5 | 0.24 | 1.4 | 55 | 13 |

| **Element** | **Cr** | **Cu** | **Fe** | **Hf** | **K** | **La** | **Li** | **Mg** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **0.01** | **0.1** | **0.01** | **0.1** | **0.1** | **0.01** |
| **Samples** | **ppm** | **ppm** | **%** | **ppm** | **%** | **ppm** | **ppm** | **%** |
| **4587** | 96.2 | 37.8 | 4.26 | 2.3 | 1.83 | 35.4 | 71.8 | 0.69 |
| **6004** | 96.7 | 33.6 | 4.33 | 2.5 | 1.86 | 36 | 81.9 | 0.77 |
| **6008** | 118.2 | 38.9 | 3.47 | 2.8 | 2.24 | 28.9 | 113.4 | 0.73 |
| **6013** | 112.2 | 65.4 | 4.05 | 2.7 | 2.18 | 27.1 | 98 | 0.9 |
| **6020** | 101.9 | 41.7 | 3.38 | 2.7 | 2.15 | 31.3 | 61.6 | 0.78 |
| **6022** | 87.9 | 32.7 | 2.97 | 2.7 | 1.81 | 38 | 62.9 | 0.81 |
| **6027** | 101.6 | 33 | 2.54 | 2.6 | 1.91 | 38.7 | 45.5 | 0.57 |
| **6030** | 89.2 | 35.5 | 2.82 | 2.6 | 1.73 | 37 | 50.2 | 0.64 |
| **6033** | 89.5 | 37.9 | 2.49 | 2.7 | 1.75 | 39.4 | 42.6 | 0.55 |
| **6036** | 81.8 | 56.5 | 4.65 | 2.9 | 1.74 | 34.4 | 47.4 | 0.85 |
| **6038** | 35.1 | 28.1 | 2.46 | 3.9 | 0.87 | 26 | 33.8 | 0.98 |
| **6043** | 71.9 | 34.7 | 4.3 | 3 | 1.54 | 27.6 | 53.7 | 0.71 |

| **Element** | **Mn** | **Mo** | **Na** | **Nb** | **Ni** | **P** | **Pb** | **Rb** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **1** | **0.1** | **0.001** | **0.1** | **0.1** | **0.001** | **0.1** | **0.1** |
| **Samples** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **4587** | 135 | 15.1 | 0.476 | 13 | 51.6 | 0.085 | 19.9 | 113 |
| **6004** | 166 | 15.6 | 0.488 | 13.4 | 50.6 | 0.071 | 19.6 | 109.3 |
| **6008** | 105 | 16.5 | 0.546 | 14.9 | 62.9 | 0.07 | 22.6 | 120.4 |
| **6013** | 162 | 14.2 | 0.591 | 13.4 | 77.1 | 0.085 | 24.6 | 125 |
| **6020** | 128 | 6.8 | 0.605 | 17.6 | 51.7 | 0.075 | 20.5 | 129.8 |
| **6022** | 168 | 1.1 | 0.683 | 14.7 | 26.4 | 0.109 | 23.1 | 94.3 |
| **6027** | 117 | 1.8 | 0.575 | 10 | 33.1 | 0.101 | 15.6 | 94.4 |
| **6030** | 146 | 1 | 0.61 | 10.9 | 28.4 | 0.125 | 19.3 | 96.3 |
| **6033** | 110 | 3.4 | 0.567 | 10 | 35.4 | 0.143 | 14.8 | 93.1 |
| **6036** | 115 | 13 | 0.753 | 10.1 | 42.9 | 0.095 | 22 | 86.9 |
| **6038** | 305 | 5 | 1.396 | 19.5 | 46.1 | 0.027 | 27.6 | 33.3 |
| **6043** | 1691 | 1.8 | 0.88 | 13.3 | 41.4 | 0.073 | 24.2 | 92.2 |

| **Element** | **S** | **Sb** | **Sc** | **Sn** | **Sr** | **Ta** | **Th** | **Ti** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **1** | **0.1** | **1** | **0.1** | **0.1** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **4587** | 2.6 | 1.7 | 11 | 2.4 | 190 | 0.8 | 10 | 0.406 |
| **6004** | 2.4 | 1.5 | 12 | 2.2 | 196 | 0.9 | 9.8 | 0.4 |
| **6008** | 1.8 | 2.1 | 11 | 2.8 | 198 | 1 | 9.4 | 0.465 |
| **6013** | 2.6 | 2.5 | 13 | 2.7 | 178 | 0.9 | 10.2 | 0.413 |
| **6020** | 1.9 | 1.5 | 12 | 2.2 | 194 | 0.9 | 9.4 | 0.384 |
| **6022** | 1.1 | 1 | 10 | 2.4 | 142 | 1 | 11.8 | 0.474 |
| **6027** | 1.2 | 1 | 10 | 2.1 | 149 | 0.7 | 10.6 | 0.372 |
| **6030** | 1.4 | 0.8 | 10 | 2.1 | 165 | 0.8 | 10.7 | 0.357 |
| **6033** | 1.4 | 0.8 | 10 | 1.9 | 149 | 0.6 | 10.2 | 0.362 |
| **6036** | 4 | 0.9 | 10 | 2 | 166 | 0.7 | 10.8 | 0.344 |
| **6038** | 0.1 | 1.1 | 6 | 5.6 | 221 | 2.1 | 16.9 | 0.204 |
| **6043** | 0.2 | 1.1 | 9 | 2.9 | 183 | 1 | 10.9 | 0.335 |

| | | | | | | | ***Analysis: GROUP 4B - REE - 0.200 GM*** | |
|---|---|---|---|---|---|---|---|---|
| **Element** | **U** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ce** | **Co** |
| **LDL** | **0.1** | **1** | **0.1** | **0.1** | **1** | **0.1** | **0.5** | **0.5** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **4587** | 7.6 | 227 | 1.3 | 18.8 | 174 | 73.3 | 79.5 | 14.1 |
| **6004** | 7.7 | 224 | 1.3 | 17.7 | 113 | 80 | 76.3 | 13.8 |
| **6008** | 7.2 | 291 | 1.6 | 14.4 | 146 | 86.6 | 77.2 | 15.6 |
| **6013** | 8 | 257 | 1.3 | 19.6 | 170 | 85 | 70.3 | 18.1 |
| **6020** | 6 | 224 | 1.8 | 19.7 | 145 | 82.7 | 66.4 | 13.2 |
| **6022** | 7.1 | 306 | 1.4 | 27 | 137 | 81.9 | 103.4 | 11.9 |
| **6027** | 4.6 | 301 | 1.4 | 29.9 | 113 | 79.4 | 82.3 | 9 |
| **6030** | 4.6 | 284 | 1.4 | 27.7 | 96 | 80.7 | 78 | 8.8 |
| **6033** | 5.8 | 293 | 1.3 | 36 | 112 | 79 | 84.1 | 9.7 |
| **6036** | 7.1 | 215 | 1.1 | 27.1 | 163 | 85.5 | 72.9 | 11.5 |
| **6038** | 8.5 | 70 | 1.3 | 18.9 | 141 | 96.3 | 83.2 | 8.2 |
| **6043** | 6.4 | 135 | 1.9 | 17.6 | 139 | 91.3 | 75.7 | 12.7 |

| **Element** | **Cs** | **Dy** | **Er** | **Eu** | **Ga** | **Gd** | **Hf** | **Ho** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.05** | **0.05** | **0.05** | **0.5** | **0.05** | **0.5** | **0.05** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **4587** | 8.1 | 5.22 | 2.97 | 1.31 | 18.5 | 5.69 | 5.4 | 1.08 |
| **6004** | 9 | 5.39 | 3.02 | 1.24 | 20.4 | 5.85 | 5.2 | 0.98 |
| **6008** | 11.3 | 4.28 | 2.82 | 1.15 | 25.4 | 4.83 | 4.1 | 0.9 |
| **6013** | 9.9 | 5.41 | 2.88 | 1.33 | 22.5 | 5.62 | 4.1 | 1.07 |
| **6020** | 10.9 | 4.94 | 2.84 | 1.04 | 22 | 4.73 | 3.5 | 1.01 |
| **6022** | 7.1 | 6.79 | 3.45 | 1.89 | 19.5 | 7.25 | 6.8 | 1.3 |
| **6027** | 6.9 | 6.43 | 3.45 | 1.39 | 15.2 | 6.85 | 5.8 | 1.29 |
| **6030** | 6.8 | 5.7 | 3.04 | 1.57 | 14.7 | 6.18 | 5.5 | 1.16 |
| **6033** | 7 | 7.01 | 3.89 | 1.86 | 15.4 | 8.1 | 4.6 | 1.46 |
| **6036** | 7.1 | 4.74 | 2.88 | 1.42 | 17.6 | 5.91 | 3.9 | 1.04 |
| **6038** | 4 | 6.57 | 3.45 | 1.1 | 23 | 6.42 | 5.3 | 1.24 |
| **6043** | 8.5 | 5.22 | 3.02 | 1.14 | 21.5 | 5.23 | 4.3 | 1.06 |

| **Element** | **La** | **Lu** | **Nb** | **Nd** | **Pr** | **Sn** | **Rb** | **Sm** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.5** | **0.01** | **0.5** | **0.4** | **0.02** | **1** | **0.5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **4587** | 37.7 | 0.46 | 17.4 | 35.9 | 9.41 | < 1 | 125.3 | 6.8 |
| **6004** | 38 | 0.44 | 16.9 | 35.2 | 9.04 | 1 | 126.7 | 6.5 |
| **6008** | 40.6 | 0.44 | 18.3 | 33.3 | 8.99 | 1 | 149.4 | 6 |
| **6013** | 35.4 | 0.48 | 16.2 | 32.8 | 8.56 | 2 | 135.4 | 6.6 |
| **6020** | 34.2 | 0.46 | 19.7 | 29.3 | 7.83 | 1 | 133.9 | 5.9 |
| **6022** | 46.9 | 0.49 | 19.9 | 46.6 | 12.51 | 2 | 114.5 | 9.5 |
| **6027** | 39.2 | 0.42 | 15.5 | 37.1 | 10.46 | 1 | 108.9 | 7.9 |
| **6030** | 37.7 | 0.44 | 15.3 | 36.5 | 9.35 | < 1 | 108.5 | 7.2 |
| **6033** | 42.1 | 0.48 | 13.9 | 41.3 | 11.04 | < 1 | 108.8 | 8.5 |
| **6036** | 36.2 | 0.39 | 13.2 | 33.6 | 8.91 | 2 | 100.3 | 6.3 |
| **6038** | 39.1 | 0.52 | 23.3 | 36.7 | 9.79 | 4 | 56.7 | 7.9 |
| **6043** | 36.7 | 0.46 | 16.1 | 32.7 | 8.78 | 1 | 108.5 | 6.5 |

| **Element** | **Sr** | **Ta** | **Tb** | **Th** | **Tm** | **U** | **V** | **W** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.5** | **0.1** | **0.01** | **0.1** | **0.05** | **0.1** | **5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **4587** | 193 | 1.1 | 0.83 | 11.2 | 0.47 | 9 | 235 | 1.4 |
| **6004** | 205.2 | 1 | 0.9 | 13.8 | 0.47 | 9.4 | 240 | 1.7 |
| **6008** | 212.2 | 1.3 | 0.69 | 14.4 | 0.42 | 9 | 298 | 2 |
| **6013** | 187.8 | 1.2 | 0.82 | 13.5 | 0.46 | 8.3 | 275 | 1.9 |
| **6020** | 183.1 | 1 | 0.8 | 9.7 | 0.45 | 6.4 | 224 | 2 |
| **6022** | 174.2 | 1.2 | 1.13 | 18 | 0.53 | 8.9 | 328 | 2.7 |
| **6027** | 175.8 | 0.9 | 1.14 | 12.3 | 0.54 | 5.4 | 266 | 1.8 |
| **6030** | 198.7 | 1 | 0.91 | 11.7 | 0.49 | 5.3 | 265 | 2.2 |
| **6033** | 174.4 | 0.9 | 1.26 | 11.5 | 0.54 | 6.8 | 284 | 2.2 |
| **6036** | 196.7 | 0.9 | 0.89 | 12.4 | 0.43 | 7.6 | 199 | 1.5 |
| **6038** | 251 | 2.5 | 1.08 | 27.8 | 0.52 | 11.1 | 79 | 1.5 |
| **6043** | 183.2 | 1.1 | 0.88 | 15.7 | 0.44 | 7 | 137 | 2.3 |

***Analysis: GROUP 4A - 0.200 GM***

| **Element** | **Y** | **Yb** | **Zr** | **Al2O3** | **Ba** | **CaO** | **Cr2O3** | **Cr2O3** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.05** | **0.5** | **0.03** | **5** | **0.01** | **0.001** | **0.001** |
| **Samples** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **%** | **%** | **%** |
| **4587** | 33.6 | 3.11 | 174.6 | 14.67 | 747 | 2.08 | 0.014 | 0.0141 |
| **6004** | 32.2 | 2.95 | 163 | 15.19 | 753 | 2.07 | 0.013 | 0.0133 |
| **6008** | 28 | 2.99 | 146 | 17.77 | 966 | 0.63 | 0.016 | 0.0158 |
| **6013** | 32.7 | 2.96 | 143.7 | 16.58 | 986 | 0.48 | 0.015 | 0.0151 |
| **6020** | 31.8 | 2.83 | 135.1 | 15.52 | 912 | 0.79 | 0.014 | 0.0137 |
| **6022** | 42.5 | 3.35 | 227.2 | 14.94 | 939.7 | 0.7 | 0.01 | |
| **6027** | 40.9 | 3.06 | 188.7 | 12.02 | 793.9 | 2.06 | 0.014 | |
| **6030** | 36.8 | 3.24 | 189.2 | 12.73 | 767.6 | 3.33 | 0.011 | |
| **6033** | 45.4 | 3.55 | 172.8 | 12.03 | 810.5 | 1.31 | 0.012 | |
| **6036** | 31.4 | 2.42 | 126.8 | 13.47 | 657.4 | 0.82 | 0.012 | |
| **6038** | 37.4 | 3.55 | 146.1 | 17.26 | 413 | 0.54 | 0.005 | 0.0049 |
| **6043** | 32.8 | 3.13 | 131.7 | 15.33 | 504 | 0.48 | 0.009 | 0.0093 |

| **Element** | **Fe2O3** | **K2O** | **LOI** | **MgO** | **MnO** | **Na2O** | **Ni** | **P2O5** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.04** | **0.04** | **0.1** | **0.01** | **0.01** | **0.01** | **30** | **0.01** |
| **Samples** | **%** | **%** | **%** | **%** | **%** | **%** | **ppm** | **%** |
| **4587** | 5.95 | 2.47 | 13.6 | 1.26 | 0.02 | 0.7 | 64 | 0.21 |
| **6004** | 6.1 | 2.44 | 13.2 | 1.38 | 0.02 | 0.72 | 31 | 0.17 |
| **6008** | 5.1 | 2.81 | 12.2 | 1.37 | 0.02 | 0.75 | 63 | 0.17 |
| **6013** | 5.75 | 2.71 | 13.5 | 1.45 | 0.02 | 0.78 | 87 | 0.22 |
| **6020** | 4.72 | 2.76 | 11.3 | 1.42 | 0.02 | 0.82 | 46 | 0.17 |
| **6022** | 4.12 | 2.5 | 9.1 | 1.67 | 0.02 | 1.09 | 23 | 0.26 |
| **6027** | 3.62 | 2.45 | 9.3 | 1.15 | 0.02 | 0.94 | 31 | 0.24 |
| **6030** | 4.01 | 2.44 | 9.9 | 1.3 | 0.02 | 0.91 | < 20 | 0.29 |
| **6033** | 3.62 | 2.46 | 9.8 | 1.12 | 0.01 | 0.85 | 23 | 0.35 |
| **6036** | 6.52 | 2.34 | 18.8 | 1.67 | 0.02 | 1.03 | 26 | 0.22 |
| **6038** | 3.69 | 1.22 | 12.5 | 2.03 | 0.05 | 2.13 | < 20 | 0.07 |
| **6043** | 6.1 | 2.02 | 11.9 | 1.31 | 0.22 | 1.16 | 41 | 0.16 |

|  |  |  |  |  |  |  | ***Analysis: CO2*** |  |
|---|---|---|---|---|---|---|---|---|
| **Element** | **Sc** | **SiO2** | **TiO2** | **TOT/C** | **TOT/S** | **SUM** | **C/ORG** | **C/GRA** |
| **LDL** | **1** | **0.02** | **0.01** | **0.01** | **0.01** |  |  |  |
| **Samples** | **ppm** | **%** | **%** | **%** | **%** | **%** | **%** | **%** |
| **4587** | 14 | 57.64 | 0.77 | 4.08 | 2.73 | 99.48 | 3.65 | 0.04 |
| **6004** | 16 | 57.2 | 0.77 | 4.3 | 2.44 | 99.37 | 3.68 | 0.02 |
| **6008** | 17 | 57.59 | 0.82 | 3.67 | 1.82 | 99.36 | 3.53 | 0.03 |
| **6013** | 17 | 57 | 0.74 | 3.49 | 2.64 | 99.37 | 3.47 | 0.02 |
| **6020** | 16 | 61.02 | 0.7 | 2.3 | 1.01 | 99.37 | 2.19 | 0.03 |
| **6022** | 13 | 64.26 | 0.75 | 1.94 | 1.46 | 99.42 | 1.89 | 0.02 |
| **6027** | 12 | 66.96 | 0.68 | 2.38 | 1.53 | 99.45 | 2.12 | 0.02 |
| **6030** | 12 | 64.14 | 0.66 | 2.56 | 1.75 | 99.75 | 2.01 | < .02 |
| **6033** | 12 | 67.41 | 0.65 | 2.92 | 1.83 | 99.62 | 2.81 | < .02 |
| **6036** | 12 | 54.16 | 0.59 | 5.08 | 4.57 | 99.65 | 5.04 | 0.02 |
| **6038** | 8 | 59.36 | 0.42 | 1.87 | 0.16 | 99.32 | 1.7 | 0.02 |
| **6043** | 13 | 59.95 | 0.66 | 3.29 | 0.22 | 99.36 | 2.75 | 0.09 |

| **Element** | **CO2** | **SO4** |
|---|---|---|
| **LDL** |  |  |
| **Samples** | **%** | **%** |
| **4587** | 1.43 | 2.62 |
| **6004** | 2.23 | 2.08 |
| **6008** | 0.42 | 0.56 |
| **6013** | 0.02 | 0.35 |
| **6020** | 0.29 | 0.8 |
| **6022** | 0.11 | 0.61 |
| **6027** | 0.87 | 2.18 |
| **6030** | 1.97 | 2.12 |
| **6033** | 0.42 | 1.21 |
| **6036** | 0.09 | 1.39 |
| **6038** | 0.53 | 0.16 |
| **6043** | 1.66 | 0.13 |

| Samples | Hole | Latitude | Longitude | From (m) | To (m) | Analysis Date |
|---|---|---|---|---|---|---|
| **6088** | 7BK03 | 57.73145 | -111.87704 | 72.430 | 72.530 | April 2004 |
| **6089** | 7BK03 | 57.73145 | -111.87704 | 73.420 | 73.530 | Dec. 2003 |
| **6090** | 7BK03 | 57.73145 | -111.87704 | 74.410 | 74.510 | Dec. 2003 |
| **6090** | 7BK03 | 57.73145 | -111.87704 | 74.410 | 74.510 | April 2004 |
| **6091** | 7BK03 | 57.73145 | -111.87704 | 75.560 | 75.680 | Dec. 2003 |
| **6092** | 7BK03 | 57.73145 | -111.87704 | 78.690 | 78.710 | Dec. 2003 |
| **6093** | 7BK03 | 57.73145 | -111.87704 | 76.440 | 76.530 | Dec. 2003 |
| **6094** | 7BK03 | 57.73145 | -111.87704 | 77.340 | 77.430 | Dec. 2003 |
| **6120** | 7BK03 | 57.73145 | -111.87704 | 78.530 | 78.680 | Dec. 2003 |
| **6121** | 7BK03 | 57.73145 | -111.87704 | 78.820 | 78.920 | Dec. 2003 |
| **6122** | 7BK03 | 57.73145 | -111.87704 | 79.400 | 79.530 | Dec. 2003 |
| **6123** | 7BK03 | 57.73145 | -111.87704 | 80.400 | 80.510 | Dec. 2003 |
| **6125** | 7BK03 | 57.73145 | -111.87704 | 81.380 | 81.500 | Dec. 2003 |
| **6126** | 7BK03 | 57.73145 | -111.87704 | 82.350 | 82.480 | Dec. 2003 |
| **6128** | 7BK03 | 57.73145 | -111.87704 | 83.340 | 83.440 | Dec. 2003 |
| **6130** | 7BK03 | 57.73145 | -111.87704 | 84.280 | 84.410 | Dec. 2003 |
| **6133** | 7BK03 | 57.73145 | -111.87704 | 85.440 | 85.510 | Dec. 2003 |
| **6134** | 7BK03 | 57.73145 | -111.87704 | 86.360 | 86.480 | Dec. 2003 |
| **6135** | 7BK03 | 57.73145 | -111.87704 | 87.395 | 87.545 | Dec. 2003 |
| **6136** | 7BK03 | 57.73145 | -111.87704 | 89.390 | 89.520 | Dec. 2003 |
| **6137** | 7BK03 | 57.73145 | -111.87704 | 91.370 | 91.510 | Dec. 2003 |
| **6138** | 7BK03 | 57.73145 | -111.87704 | 93.400 | 93.530 | Dec. 2003 |
| **6139** | 7BK03 | 57.73145 | -111.87704 | 94.400 | 94.520 | Dec. 2003 |
| **6140** | 7BK03 | 57.73145 | -111.87704 | 95.370 | 95.480 | Dec. 2003 |
| **6141** | 7BK03 | 57.73145 | -111.87704 | 93.610 | 96.410 | Dec. 2003 |
| **6142** | 7BK03 | 57.73145 | -111.87704 | 97.530 | 97.680 | Dec. 2003 |
| **6144** | 7BK03 | 57.73145 | -111.87704 | 98.400 | 98.510 | Dec. 2003 |
| **6145** | 7BK03 | 57.73145 | -111.87704 | 99.380 | 99.470 | Dec. 2003 |
| **6146** | 7BK03 | 57.73145 | -111.87704 | 100.420 | 100.520 | Dec. 2003 |
| **6149** | 7BK03 | 57.73145 | -111.87704 | 100.540 | 100.590 | Dec. 2003 |
| **6151** | 7BK03 | 57.73145 | -111.87704 | 100.890 | 100.940 | Dec. 2003 |
| **6152** | 7BK03 | 57.73145 | -111.87704 | 100.800 | 100.890 | Dec. 2003 |
| **6153** | 7BK03 | 57.73145 | -111.87704 | 101.400 | 101.490 | Dec. 2003 |
| **6153** | 7BK03 | 57.73145 | -111.87704 | 101.400 | 101.490 | April 2004 |
| **6154** | 7BK03 | 57.73145 | -111.87704 | 102.400 | 102.450 | Dec. 2003 |

| Samples | Probability of Fm | Formation | Sample Description |
|---|---|---|---|
| 6088 | Unknown | Labiche | Shale above SWS, light grey, silty |
| 6089 | Unknown | Labiche | Med grey shale above SWS |
| 6090 | Unknown | Labiche | Shale above SWS, light grey, silty |
| 6090 | Unknown | Labiche | Shale above SWS, light grey, silty |
| 6091 | Unknown | Second White Specks (or younger) | Dk grey shale fragments, small amount of silt |
| 6092 | Unknown | Second White Specks (or younger) | Concretion? White coloured with red coloring in areas, brittle |
| 6093 | Unknown | Second White Specks (or younger) | Dk grey shale, crumbly, mica rich, some fish fragments |
| 6094 | Unknown | Second White Specks (or younger) | Dk grey shale, crumbly thin steel grey bentonite |
| 6120 | Unknown | Second White Specks (or younger) | Dk grey shale - silty, some thin bentonites |
| 6121 | Unknown | Second White Specks (or younger) | Dk grey shale + dominantly bentonites - blue/grey |
| 6122 | Unknown | Second White Specks (or younger) | Dk grey shale, silt, some shelly fragments |
| 6123 | Unknown | Second White Specks (or younger) | Dk grey shale |
| 6125 | Unknown | Second White Specks (or younger) | Dk grey shale, slightly silty |
| 6126 | Unknown | Second White Specks (or younger) | Dk grey shale, blocky |
| 6128 | Unknown | Second White Specks (or younger) | Dk grey shale, thin bentonite, micas, silt |
| 6130 | Unknown | Second White Specks (or younger) | Dk grey shale, thin bentonite, shelly fragments, silty |
| 6133 | Unknown | Second White Specks | Dk grey shale with shells, some silt |
| 6134 | Unknown | Second White Specks | Dk grey shale, silty, some shelly debris |
| 6135 | Unknown | Second White Specks | Dk grey shale |
| 6136 | Unknown | Second White Specks | Dk grey shale, some silt |
| 6137 | Unknown | Second White Specks | Dk grey shale, lots of silt |
| 6138 | Unknown | Second White Specks | Dk grey shale, some silt |
| 6139 | Unknown | Second White Specks | Dk grey shale, some silt |
| 6140 | Unknown | Second White Specks | Dk grey shale, silt/vf sand lams |
| 6141 | Unknown | Second White Specks | Med grey shale, fish fragments, dark micas, some silt |
| 6142 | Unknown | Second White Specks | Dk grey shale, silty lams |
| 6144 | Unknown | Second White Specks | Dk grey shale, very platey, fish fragments, silty lams, shelly debris |
| 6145 | Unknown | Second White Specks | Dk grey shale, very platey, fish fragments, silty lams |
| 6146 | Unknown | Second White Specks | Dk grey shale, silty |
| 6149 | Unknown | Second White Specks | Carbonate filled shale, fractures filled with coarse carbonate |
| 6151 | Unknown | Second White Specks | Bone Bed? Thin section? |
| 6152 | Unknown | Second White Specks | Bone Bed? Sandy, organic debris |
| 6153 | Unknown | Belle Fourche | Calcareous area of bone bed - micropaleo? Heavy, white/brown colouration, organic debris |
| 6153 | Unknown | Belle Fourche | Med grey shale below SWS, some silt |
| 6154 | Unknown | Belle Fourche | Med grey shale below SWS |

***Analysis: GROUP 1F1 - 1.00 GM***

| **Element** | **Ag** | **Al** | **As** | **Au** | **B** | **Ba** | **Be** | **Bi** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** | **0.1** | **0.02** |
| **Samples** | **ppb** | **%** | **ppm** | **ppb** | **ppm** | **ppm** | **ppm** | **ppm** |
| **6089** | 91 | 1.22 | 24.5 | 1 | 18 | 198.7 | 0.9 | 0.3 |
| **6090** | 82 | 1.09 | 17.8 | 0.6 | 15 | 182.4 |  | 0.3 |
| **6091** | 560 | 1.78 | 43.9 | 2.3 | 32 | 25.9 | 1 | 0.5 |
| **6092** | 190 | 1.85 | 51.9 | 3.9 | 8 | 3.8 |  | 0.2 |
| **6093** | 469 | 1.61 | 68.8 | 1.8 | 21 | 26.5 |  | 0.55 |
| **6094** | 1331 | 1.95 | 127 | 3.7 | 26 | 14.9 | 1.5 | 0.37 |
| **6120** | 215 | 2 | 69.6 | 0.9 | 14 | 26.8 |  | 0.21 |
| **6121** | 118 | 1.56 | 21 | 1 | 21 | 141.6 |  | 0.52 |
| **6122** | 994 | 1.46 | 65.1 | 2.1 | 30 | 27.6 | 1.7 | 0.41 |
| **6123** | 801 | 0.96 | 54.5 | 2.2 | 21 | 41.5 |  | 0.39 |
| **6125** | 594 | 0.75 | 44.7 | 2.5 | 19 | 78.6 | 1.2 | 0.33 |
| **6126** | 744 | 1 | 49.4 | 2.1 | 22 | 58.6 |  | 0.41 |
| **6128** | 630 | 0.98 | 47.3 | 2.2 | 22 | 59.5 | 1 | 0.38 |
| **6130** | 592 | 1.08 | 46 | 3.1 | 19 | 64.3 |  | 0.38 |
| **6133** | 884 | 0.91 | 47.1 | 3.9 | 20 | 82.2 | 0.7 | 0.35 |
| **6134** | 1181 | 1.23 | 67.9 | 3.4 | 21 | 35.3 |  | 0.45 |
| **6135** | 1053 | 1.21 | 66.8 | 4.5 | 22 | 34.8 | 0.7 | 0.46 |
| **6136** | 1067 | 1.79 | 43.4 | 3.3 | 23 | 62.9 | 1.1 | 0.43 |
| **6137** | 437 | 0.99 | 26 | 2.1 | 19 | 74 | 0.9 | 0.32 |
| **6138** | 120 | 1.13 | 17.1 | 1.1 | 19 | 184.1 |  | 0.48 |
| **6139** | 98 | 1.12 | 21.2 | 1 | 17 | 173.8 |  | 0.47 |
| **6140** | 132 | 1.22 | 22.2 | 1.2 | 21 | 135.7 | 0.8 | 0.44 |
| **6141** | 88 | 1.47 | 21.6 | 1.1 | 25 | 151.2 | 1.3 | 0.41 |
| **6142** | 337 | 0.45 | 31.6 | 1.5 | 12 | 105.4 | 0.3 | 0.2 |
| **6144** | 519 | 0.71 | 53.1 | 1.8 | 16 | 78.3 |  | 0.32 |
| **6145** | 549 | 0.9 | 54.3 | 1.7 | 19 | 60.3 | 0.6 | 0.34 |
| **6146** | 708 | 0.81 | 100.8 | 2.4 | 19 | 22.5 |  | 0.47 |
| **6149** | 30 | 0.14 | 7.6 | 0.3 | 3 | 30.2 |  | < .02 |
| **6151** | 639 | 0.33 | 30.5 | 4 | 11 | 160.8 | 0.5 | 0.11 |
| **6152** | 470 | 0.33 | 26.4 | 2.9 | 11 | 142.8 |  | 0.09 |
| **6153** | 118 | 1 | 16.5 | 0.9 | 17 | 125.9 |  | 0.3 |
| **6154** | 117 | 1.48 | 14.7 | 0.3 | 20 | 97.8 | 0.8 | 0.39 |

| **Element** | **Ca** | **Cd** | **Ce** | **Co** | **Cr** | **Cs** | **Cu** | **Fe** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.01** | **0.01** | **0.1** | **0.1** | **0.5** | **0.02** | **0.01** | **0.01** |
| **Samples** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **6089** | 0.45 | 0.33 | 24.5 | 15.7 | 21.3 | 1.76 | 31.25 | 2.3 |
| **6090** | 0.4 | 0.44 | | 15.8 | 19.2 | | 28.24 | 2.06 |
| **6091** | 0.67 | 3.2 | 38.2 | 15.2 | 30.2 | 0.57 | 108.76 | 3.35 |
| **6092** | 0.57 | 1.05 | | 4.9 | 4.5 | | 23.55 | 18.26 |
| **6093** | 1.09 | 3.67 | | 23.6 | 35.2 | | 114.06 | 3.46 |
| **6094** | 2.08 | 18.57 | 36.3 | 44 | 21 | 0.33 | 111.26 | 5.77 |
| **6120** | 6.56 | 2.54 | | 11.8 | 2.6 | | 43.45 | 3.47 |
| **6121** | 1.16 | 0.75 | | 1.8 | 0.9 | | 3.23 | 1.28 |
| **6122** | 4.98 | 16.68 | 111.8 | 36.5 | 24.6 | 0.31 | 94.74 | 4.2 |
| **6123** | 5.44 | 13.06 | | 30 | 24.9 | | 97 | 3.8 |
| **6125** | 6.46 | 9.64 | 29.3 | 19.2 | 19.1 | 0.33 | 73.82 | 3.04 |
| **6126** | 5.2 | 12.33 | | 26.3 | 25.6 | | 93.02 | 3.61 |
| **6128** | 4.02 | 9.4 | 36.5 | 22.1 | 18.7 | 0.36 | 69.4 | 3.23 |
| **6130** | 5.17 | 11.23 | | 22.2 | 20.9 | | 74.54 | 3.44 |
| **6133** | 4.78 | 19.09 | 29.8 | 24.1 | 25.8 | 0.47 | 90.68 | 3.44 |
| **6134** | 4.3 | 22.17 | | 32.2 | 34.3 | | 112.93 | 4.21 |
| **6135** | 3.2 | 20.39 | 76.8 | 30.8 | 34.8 | 0.57 | 109.62 | 4.11 |
| **6136** | 1.78 | 17.58 | 66.7 | 15.6 | 25.1 | 0.31 | 86.25 | 3.06 |
| **6137** | 1.07 | 2.85 | 62.6 | 12.5 | 25.8 | 1.07 | 61.32 | 2.6 |
| **6138** | 0.49 | 0.37 | | 11.8 | 22.2 | | 40.66 | 1.9 |
| **6139** | 0.61 | 0.14 | | 12.2 | 21 | | 41 | 1.83 |
| **6140** | 0.75 | 0.5 | 32.8 | 11.8 | 26.6 | 1.46 | 40.59 | 2.14 |
| **6141** | 1.02 | 0.1 | 98.1 | 11.3 | 28.5 | 1.46 | 35.3 | 1.86 |
| **6142** | 17.01 | 2.1 | 22.2 | 12 | 11.9 | 0.44 | 32.14 | 2.79 |
| **6144** | 5.19 | 3.16 | | 23.7 | 18.3 | | 58.55 | 4.06 |
| **6145** | 3.35 | 3.35 | 18.7 | 25.3 | 21 | 0.66 | 58.66 | 4.39 |
| **6146** | 0.7 | 4.45 | | 32.6 | 21.1 | | 76.07 | 6.77 |
| **6149** | 32.12 | 0.18 | | 1.5 | 0.7 | | 3.26 | 0.48 |
| **6151** | 6.63 | 2.81 | 81.7 | 7.4 | 7.7 | 0.38 | 19.62 | 2.59 |
| **6152** | 11.57 | 2.73 | | 6.3 | 7.9 | | 17.14 | 2.15 |
| **6153** | 0.57 | 0.3 | | 11.1 | 21.6 | | 27.15 | 2.5 |
| **6154** | 0.24 | 0.13 | 26.7 | 10.8 | 26.8 | 1.51 | 27.28 | 2.62 |

| **Element** | **Ga** | **Ge** | **Hf** | **Hg** | **In** | **K** | **La** | **Li** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.1** | **0.02** | **5** | **0.02** | **0.01** | **0.5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppb** | **ppm** | **%** | **ppm** | **ppm** |
| **6089** | 4 | < .1 | 0.23 | 83 | 0.04 | 0.28 | 13.1 | 27.9 |
| **6090** | 3.6 | | | 62 | | 0.25 | 14.6 | |
| **6091** | 5.4 | < .1 | 0.52 | 107 | 0.06 | 0.4 | 17.8 | 25.5 |
| **6092** | 1.9 | | | 113 | | 0.21 | < .5 | |
| **6093** | 5.7 | | | 174 | | 0.41 | 71.2 | |
| **6094** | 5.8 | 0.2 | 0.15 | 234 | 0.06 | 0.42 | 12.8 | 13.1 |
| **6120** | 4.4 | | | 64 | | 0.52 | 15.7 | |
| **6121** | 3.4 | | | 19 | | 0.1 | 21.3 | |
| **6122** | 6.3 | 0.2 | 0.05 | 204 | 0.05 | 0.36 | 64.7 | 16.1 |
| **6123** | 5.2 | | | 153 | | 0.28 | 24.2 | |
| **6125** | 4.9 | 0.2 | 0.57 | 121 | 0.03 | 0.16 | 17.3 | 15.2 |
| **6126** | 5.4 | | | 155 | | 0.3 | 22.5 | |
| **6128** | 5.6 | 0.2 | 0.57 | 122 | 0.04 | 0.23 | 21.8 | 17.1 |
| **6130** | 6 | | | 134 | | 0.22 | 23.3 | |
| **6133** | 5.1 | 0.3 | 0.46 | 147 | 0.05 | 0.2 | 19.3 | 18.3 |
| **6134** | 5 | | | 182 | | 0.3 | 71.9 | |
| **6135** | 5.3 | 0.2 | 0.11 | 167 | 0.05 | 0.31 | 54.6 | 20.2 |
| **6136** | 8.2 | 0.2 | 1.16 | 141 | 0.08 | 0.22 | 33 | 30.7 |
| **6137** | 4.6 | 0.1 | 0.07 | 125 | 0.04 | 0.25 | 37.8 | 19.8 |
| **6138** | 4.3 | | | 104 | | 0.31 | 22.8 | |
| **6139** | 4.6 | | | 113 | | 0.3 | 42 | |
| **6140** | 4.7 | < .1 | 0.29 | 106 | 0.05 | 0.34 | 20 | 27.4 |
| **6141** | 5.2 | < .1 | < .02 | 118 | 0.05 | 0.37 | 68.7 | 31.3 |
| **6142** | 3.1 | < .1 | 0.2 | 68 | 0.02 | 0.13 | 12.8 | 7.6 |
| **6144** | 3.9 | | | 110 | | 0.19 | 9.5 | |
| **6145** | 4.5 | 0.1 | 0.29 | 119 | 0.05 | 0.25 | 10.3 | 18.1 |
| **6146** | 5.5 | | | 151 | | 0.19 | 12.9 | |
| **6149** | 0.5 | | | 12 | | 0.02 | 3.8 | |
| **6151** | 1.9 | 0.1 | < .02 | 180 | 0.03 | 0.09 | 56.8 | 3.3 |
| **6152** | 2.2 | | | 139 | | 0.09 | 75.8 | |
| **6153** | 4.2 | | | 90 | | 0.27 | 12 | |
| **6154** | 5.7 | < .1 | 0.27 | 83 | 0.04 | 0.4 | 13.7 | 35.4 |

| **Element**<br>**LDL**<br>**Samples** | **Mg**<br>**0.01**<br>**%** | **Mn**<br>**1**<br>**ppm** | **Mo**<br>**0.01**<br>**ppm** | **Na**<br>**0.001**<br>**%** | **Nb**<br>**0.02**<br>**ppm** | **Ni**<br>**0.1**<br>**ppm** | **P**<br>**0.001**<br>**%** | **Pb**<br>**0.01**<br>**ppm** |
|---|---|---|---|---|---|---|---|---|
| **6089** | 0.49 | 276 | 2.2 | 0.177 | 0.07 | 39.3 | 0.08 | 17.88 |
| **6090** | 0.43 | 299 | 1.4 | 0.152 | | 34.2 | 0.086 | 16.81 |
| **6091** | 0.39 | 166 | 31.89 | 0.411 | 0.4 | 67.4 | 0.161 | 17.09 |
| **6092** | 0.22 | 273 | 27.76 | 0.398 | | 21.2 | 0.037 | 2.09 |
| **6093** | 0.44 | 171 | 18.47 | 0.378 | | 74.7 | 0.336 | 22.3 |
| **6094** | 0.33 | 279 | 83.43 | 0.49 | 0.58 | 255.4 | 0.322 | 13.04 |
| **6120** | 0.33 | 592 | 49.59 | 0.77 | | 56.6 | 0.078 | 16.93 |
| **6121** | 0.79 | 330 | 17.78 | 0.74 | | 13 | 0.033 | 36.34 |
| **6122** | 0.36 | 260 | 162.67 | 0.425 | 1.05 | 289.5 | 0.462 | 16.87 |
| **6123** | 0.33 | 173 | 147.15 | 0.322 | | 249.7 | 0.108 | 17.28 |
| **6125** | 0.35 | 194 | 120.06 | 0.2 | 1.01 | 168 | 0.068 | 15.66 |
| **6126** | 0.33 | 157 | 140.42 | 0.309 | | 228.5 | 0.104 | 17.88 |
| **6128** | 0.38 | 200 | 108.47 | 0.302 | 0.98 | 166.9 | 0.116 | 18.43 |
| **6130** | 0.4 | 205 | 104.35 | 0.304 | | 185.3 | 0.101 | 17.49 |
| **6133** | 0.38 | 139 | 107.45 | 0.212 | 0.72 | 198.1 | 0.077 | 18.12 |
| **6134** | 0.38 | 158 | 76.07 | 0.248 | | 205 | 0.381 | 19.62 |
| **6135** | 0.38 | 126 | 74.83 | 0.264 | 0.76 | 201.5 | 0.321 | 20.51 |
| **6136** | 0.7 | 265 | 33.18 | 0.422 | 0.49 | 83.3 | 0.074 | 29.84 |
| **6137** | 0.34 | 111 | 16.19 | 0.155 | 0.35 | 48.5 | 0.2 | 16.69 |
| **6138** | 0.4 | 124 | 2.78 | 0.192 | | 38 | 0.118 | 20.48 |
| **6139** | 0.39 | 119 | 1 | 0.183 | | 33.6 | 0.172 | 20.03 |
| **6140** | 0.39 | 135 | 4.97 | 0.171 | 0.14 | 41.3 | 0.112 | 19.02 |
| **6141** | 0.41 | 124 | 1.62 | 0.171 | 0.16 | 29.2 | 0.366 | 20.5 |
| **6142** | 0.42 | 1372 | 33.24 | 0.096 | 0.28 | 61.9 | 0.076 | 9.58 |
| **6144** | 0.41 | 205 | 47.46 | 0.168 | | 100.2 | 0.08 | 13.03 |
| **6145** | 0.38 | 154 | 58.49 | 0.165 | 0.38 | 106 | 0.073 | 15.03 |
| **6146** | 0.35 | 158 | 36.08 | 0.186 | | 97.7 | 0.062 | 17.67 |
| **6149** | 0.42 | 2012 | 4.01 | 0.045 | | 2.7 | 0.023 | 0.9 |
| **6151** | 0.87 | 255 | 6.74 | 0.034 | 0.27 | 27.8 | 0.358 | 10.06 |
| **6152** | 0.57 | 379 | 8.3 | 0.041 | | 25.5 | 0.533 | 7.24 |
| **6153** | 0.37 | 131 | 3.79 | 0.204 | | 36.1 | 0.081 | 15.78 |
| **6154** | 0.45 | 127 | 1.81 | 0.214 | 0.09 | 33.9 | 0.061 | 20.69 |

| **Element** | **Pd** | **Pt** | **Rb** | **Re** | **S** | **Sb** | **Sc** | **Se** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **10** | **2** | **0.1** | **1** | **0.02** | **0.02** | **0.1** | **0.1** |
| **Samples** | **ppb** | **ppb** | **ppm** | **ppb** | **%** | **ppm** | **ppm** | **ppm** |
| **6089** | < 10 | < 2 | 24.2 | 6 | 0.67 | 0.84 | 5.1 | 1.4 |
| **6090** | | | | | 0.63 | 0.67 | 4.7 | 1.4 |
| **6091** | < 10 | 5 | 14.6 | 190 | 2.65 | 3.18 | 4.5 | 20.8 |
| **6092** | | | | | 22.09 | 1.34 | 1 | 38.4 |
| **6093** | | | | | 3.53 | 5.66 | 7.3 | 20.7 |
| **6094** | 16 | 9 | 10.5 | 1011 | 5.8 | 16.8 | 7 | 65.2 |
| **6120** | | | | | 3.6 | 7.56 | 2.2 | 12.3 |
| **6121** | | | | | 1.37 | 4.5 | 1.6 | 6.7 |
| **6122** | < 10 | 6 | 11.1 | 673 | 3.79 | 15.33 | 6 | 47.8 |
| **6123** | | | | | 4.36 | 11.26 | 3.5 | 42.3 |
| **6125** | < 10 | 4 | 9.4 | 363 | 3.3 | 7.47 | 3.5 | 33.5 |
| **6126** | | | | | 4.03 | 10.06 | 4 | 40.5 |
| **6128** | < 10 | 7 | 10.3 | 425 | 3.52 | 9.16 | 3.4 | 36 |
| **6130** | | | | | 3.94 | 11.3 | 3.7 | 41 |
| **6133** | 14 | 5 | 12.1 | 483 | 3.88 | 9.13 | 3.4 | 54.8 |
| **6134** | | | | | 4.78 | 11.7 | 6.2 | 57.1 |
| **6135** | 17 | 3 | 15.1 | 526 | 4.71 | 9.28 | 5.8 | 56 |
| **6136** | < 10 | 4 | 10.4 | 288 | 3.57 | 6.28 | 3.8 | 43.4 |
| **6137** | < 10 | < 2 | 18 | 109 | 2.29 | 2.43 | 3.8 | 14.5 |
| **6138** | | | | | 1.39 | 1.11 | 3.7 | 2.9 |
| **6139** | | | | | 1.26 | 0.74 | 4.3 | 2.2 |
| **6140** | < 10 | < 2 | 23.5 | 33 | 1.49 | 0.81 | 4.3 | 3.7 |
| **6141** | < 10 | 2 | 23.8 | 6 | 1.11 | 0.46 | 7.3 | 2.1 |
| **6142** | < 10 | < 2 | 9.2 | 69 | 3.22 | 1.38 | 2.4 | 6.1 |
| **6144** | | | | | 5.04 | 3.07 | 3.4 | 7.8 |
| **6145** | < 10 | 3 | 15.4 | 108 | 5.34 | 2.13 | 3.7 | 8.9 |
| **6146** | | | | | 8.65 | 3.01 | 1.9 | 8.6 |
| **6149** | | | | | 0.54 | 0.52 | 0.8 | 1.2 |
| **6151** | 10 | 2 | 5.7 | 35 | 1.62 | 1.76 | 2.6 | 3.5 |
| **6152** | | | | | 1.56 | 1.65 | 3.7 | 3 |
| **6153** | | | | | 1.94 | 0.51 | 3.3 | 1.5 |
| **6154** | < 10 | < 2 | 27.2 | 10 | 1.62 | 0.36 | 4.7 | 1.2 |

| **Element** | **Sn** | **Sr** | **Ta** | **Te** | **Th** | **Ti** | **Tl** | **U** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.5** | **0.05** | **0.02** | **0.1** | **0.001** | **0.02** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **6089** | 0.5 | 106.2 | < .05 | 0.08 | 5.5 | 0.005 | 0.13 | 1.57 |
| **6090** |  | 105.3 |  | 0.07 | 5.7 | 0.002 | 0.1 | 1.52 |
| **6091** | 1.2 | 207 | < .05 | 0.18 | 3 | 0.01 | 0.87 | 11.26 |
| **6092** |  | 13.4 |  | 0.17 | 0.2 | 0.001 | 0.72 | 1.95 |
| **6093** |  | 252 |  | 0.17 | 8.7 | 0.005 | 0.72 | 27.02 |
| **6094** | 1.2 | 114.5 | < .05 | 0.41 | 1.3 | 0.011 | 8.21 | 48.57 |
| **6120** |  | 459.4 |  | 0.07 | 4.4 | 0.001 | 2.3 | 24.24 |
| **6121** |  | 358.3 |  | 0.03 | 20.9 | 0.003 | 1.42 | 9.85 |
| **6122** | 1.8 | 323.2 | < .05 | 0.22 | 8.5 | 0.012 | 7.38 | 69.58 |
| **6123** |  | 222.6 |  | 0.17 | 5.3 | 0.005 | 6.16 | 32.12 |
| **6125** | 0.8 | 148.2 | < .05 | 0.11 | 4.2 | 0.004 | 4.78 | 22.17 |
| **6126** |  | 221.6 |  | 0.15 | 5.4 | 0.004 | 5.75 | 33.65 |
| **6128** | 0.9 | 176.4 | < .05 | 0.14 | 5.6 | 0.003 | 4.77 | 24.4 |
| **6130** |  | 216.2 |  | 0.13 | 6.1 | 0.005 | 5.7 | 24.99 |
| **6133** | 0.8 | 153.2 | < .05 | 0.18 | 5 | 0.002 | 7.6 | 20.48 |
| **6134** |  | 203 |  | 0.23 | 10.1 | 0.006 | 8.28 | 47.61 |
| **6135** | 0.8 | 170 | < .05 | 0.22 | 8.2 | 0.004 | 8.01 | 35.93 |
| **6136** | 2.4 | 187.2 | < .05 | 0.22 | 11.6 | 0.003 | 4.45 | 8.66 |
| **6137** | 1 | 104.2 | < .05 | 0.11 | 7.5 | 0.003 | 1.28 | 10.19 |
| **6138** |  | 101.9 |  | 0.1 | 9.2 | 0.002 | 0.3 | 3.83 |
| **6139** |  | 117 |  | 0.14 | 9.8 | 0.002 | 0.18 | 6.82 |
| **6140** | 1.1 | 101.6 | < .05 | 0.1 | 6.8 | 0.002 | 0.35 | 3.59 |
| **6141** | 0.9 | 152.6 | < .05 | 0.11 | 11.6 | 0.003 | 0.15 | 9.11 |
| **6142** | 0.7 | 126.7 | < .05 | 0.1 | 3 | 0.002 | 1.34 | 12.45 |
| **6144** |  | 128.9 |  | 0.17 | 4.4 | 0.001 | 1.64 | 16.99 |
| **6145** | 0.7 | 107.2 | < .05 | 0.16 | 4.4 | 0.001 | 2.13 | 17.53 |
| **6146** |  | 74.3 |  | 0.34 | 5.2 | 0.003 | 1.72 | 10.38 |
| **6149** |  | 137.5 |  | 0.02 | 0.2 | 0.002 | 0.11 | 4.79 |
| **6151** | 0.5 | 171.7 | < .05 | 0.22 | 3.4 | 0.006 | 1.73 | 18.57 |
| **6152** |  | 208.8 |  | 0.16 | 3.6 | 0.005 | 0.94 | 35.73 |
| **6153** |  | 82.4 |  | 0.05 | 6.9 | 0.002 | 0.21 | 3.17 |
| **6154** | 1.1 | 84.6 | < .05 | 0.06 | 9.3 | 0.002 | 0.21 | 2.08 |

***Analysis: GROUP 1EX - 0.25 GM***

| **Element** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ag** | **Al** | **As** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **2** | **0.1** | **0.01** | **0.1** | **0.1** | **0.1** | **0.01** | **1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** |
| **6088** | | | | | | 0.1 | 7.59 | 25 |
| **6089** | 38 | < .1 | 13.52 | 121.8 | 10.6 | 0.1 | 7.22 | 21 |
| **6090** | 37 | < .1 | | 132.6 | | 0.1 | 7.43 | 21 |
| **6091** | 158 | < .1 | 33.43 | 164.5 | 25.3 | 0.6 | 7.37 | 26 |
| **6092** | 42 | < .1 | | 51.4 | | | | |
| **6093** | 167 | < .1 | | 183.6 | | | | |
| **6094** | 231 | < .1 | 55.57 | 439.9 | 18.1 | 1.2 | 7.16 | 65 |
| **6120** | 28 | < .1 | | 129.7 | | | | |
| **6121** | 51 | < .1 | | 105.8 | | | | |
| **6122** | 362 | < .1 | 82.19 | 468.9 | 8.8 | 0.9 | 6.92 | 21 |
| **6123** | 288 | < .1 | | 338.8 | | | | |
| **6125** | 239 | < .1 | 19.55 | 254.3 | 37.1 | 0.7 | 5.88 | 22 |
| **6126** | 285 | < .1 | | 325.8 | | | | |
| **6128** | 191 | < .1 | 24.44 | 260.7 | 37.7 | 0.7 | 6.68 | 23 |
| **6130** | 251 | < .1 | | 269.3 | | | | |
| **6133** | 453 | < .1 | 22.12 | 368.6 | 27 | 0.9 | 6.35 | 19 |
| **6134** | 556 | < .1 | | 463.8 | | | | |
| **6135** | 527 | < .1 | 69.9 | 415.4 | 14.1 | 1.1 | 6.13 | 29 |
| **6136** | 328 | < .1 | 21.39 | 306 | 47.8 | 1.1 | 8.04 | 14 |
| **6137** | 137 | < .1 | 40.71 | 141.6 | 10.5 | 0.5 | 6.4 | 15 |
| **6138** | 80 | < .1 | | 106.8 | | | | |
| **6139** | 73 | < .1 | | 103.6 | | | | |
| **6140** | 106 | < .1 | 22.41 | 109.8 | 15.7 | 0.1 | 8.11 | 14 |
| **6141** | 124 | < .1 | 76.17 | 86.5 | 2.5 | 0.1 | 7.77 | 14 |
| **6142** | 84 | < .1 | 19.2 | 115 | 14.8 | 0.4 | 3.51 | 26 |
| **6144** | 114 | < .1 | | 216.8 | | | | |
| **6145** | 121 | < .1 | 14.12 | 222.9 | 15.4 | 0.6 | 6.77 | 44 |
| **6146** | 102 | < .1 | | 256.9 | | | | |
| **6149** | 16 | < .1 | | 9.3 | | | | |
| **6151** | 24 | < .1 | 55.03 | 112.7 | 5.6 | 0.8 | 1.61 | 22 |
| **6152** | 25 | < .1 | | 119.2 | | | | |
| **6153** | 35 | < .1 | | 112 | | 0.1 | 7.48 | 16 |
| **6154** | 41 | < .1 | 11.43 | 106.7 | 10.7 | 0.1 | 8.96 | 12 |

| Element | Au | Ba | Be | Bi | Ca | Cd | Ce | Co |
|---|---|---|---|---|---|---|---|---|
| LDL | 0.1 | 1 | 1 | 0.1 | 0.01 | 0.1 | 1 | 1 |
| Samples | ppm | ppm | ppm | ppm | % | ppm | ppm | ppm |
| 6088 | < .1 | 782 | 1 | 0.3 | 0.42 | 0.4 | 59 | 15 |
| 6089 | < .1 | 814 | 2 | 0.3 | 0.35 | 0.3 | 46 | 16 |
| 6090 | < .1 | 935 | 2 | 0.3 | 0.41 | 0.4 | 63 | 16 |
| 6091 | < .1 | 27 | 1 | 0.5 | 0.55 | 3.5 | 49 | 17 |
| 6094 | < .1 | 16 | 4 | 0.4 | 2.38 | 17.9 | 64 | 46 |
| 6122 | < .1 | 26 | 1 | 0.4 | 4.9 | 16.4 | 118 | 33 |
| 6125 | < .1 | 60 | 2 | 0.5 | 8.01 | 8.9 | 56 | 23 |
| 6128 | < .1 | 91 | 1 | 0.5 | 4.87 | 9 | 61 | 23 |
| 6133 | < .1 | 63 | 2 | 0.4 | 5.4 | 17.5 | 55 | 24 |
| 6135 | < .1 | 50 | 1 | 0.5 | 3.44 | 19.1 | 98 | 31 |
| 6136 | < .1 | 72 | 1 | 0.4 | 1.97 | 15.6 | 84 | 16 |
| 6137 | < .1 | 65 | 4 | 0.4 | 1.26 | 2.7 | 86 | 15 |
| 6140 | < .1 | 234 | 1 | 0.5 | 0.85 | 0.5 | 74 | 14 |
| 6141 | < .1 | 259 | 1 | 0.4 | 1.16 | 0.1 | 135 | 14 |
| 6142 | < .1 | 237 | 1 | 0.2 | 18.37 | 1.9 | 31 | 16 |
| 6145 | < .1 | 87 | 1 | 0.3 | 3.54 | 2.8 | 55 | 27 |
| 6151 | < .1 | 110 | 1 | 0.1 | 7.24 | 2.5 | 83 | 7 |
| 6153 | < .1 | 251 | 2 | 0.3 | 0.47 | 0.3 | 62 | 11 |
| 6154 | < .1 | 230 | 3 | 0.4 | 0.28 | 0.3 | 69 | 13 |

| Element | Cr | Cu | Fe | Hf | K | La | Li | Mg |
|---|---|---|---|---|---|---|---|---|
| LDL | 0.1 | 0.1 | 0.01 | 0.1 | 0.01 | 0.1 | 0.1 | 0.01 |
| Samples | ppm | ppm | % | ppm | % | ppm | ppm | % |
| 6088 | 110.8 | 26.3 | 3.47 | 2.9 | 1.93 | 33.8 | 69.2 | 0.78 |
| 6089 | 87.2 | 31.4 | 3.37 | 2.4 | 1.85 | 25.3 | 68.6 | 0.85 |
| 6090 | 110.5 | 29.3 | 3.38 | 3.2 | 2.05 | 34.9 | 80.7 | 0.79 |
| 6091 | 107.7 | 106.7 | 4.33 | 3.4 | 1.92 | 24.5 | 74.6 | 0.79 |
| 6094 | 64.5 | 113.3 | 6.51 | 3.2 | 1.35 | 30.5 | 35.4 | 0.67 |
| 6122 | 64.3 | 88 | 4.62 | 2.6 | 1.37 | 75.6 | 34.1 | 0.73 |
| 6125 | 74.9 | 81.3 | 4 | 3 | 1.36 | 30.9 | 50.3 | 0.97 |
| 6128 | 72.7 | 74.6 | 4.02 | 3 | 1.6 | 35.6 | 51.4 | 0.97 |
| 6133 | 81.4 | 89.2 | 4.1 | 2.8 | 1.54 | 32.6 | 54.6 | 0.89 |
| 6135 | 85.8 | 106.4 | 4.81 | 2.4 | 1.81 | 67 | 45.6 | 0.72 |
| 6136 | 62.7 | 88.2 | 3.6 | 6.1 | 1.33 | 44.7 | 91.8 | 1.76 |
| 6137 | 91.7 | 64.8 | 3.51 | 2.7 | 2.1 | 51.9 | 50.9 | 0.72 |
| 6140 | 89.3 | 44.5 | 3.02 | 3.2 | 2.41 | 45.5 | 83.7 | 0.86 |
| 6141 | 98.9 | 41 | 2.69 | 3.7 | 2.3 | 88.7 | 84.3 | 0.82 |
| 6142 | 52.5 | 37.1 | 3.54 | 1.4 | 0.98 | 18.7 | 28.5 | 0.7 |
| 6145 | 65.8 | 62 | 5.2 | 2.1 | 2.05 | 31.3 | 50.7 | 0.8 |
| 6151 | 14.6 | 21.8 | 2.76 | 0.5 | 0.84 | 60.1 | 12.9 | 0.92 |
| 6153 | 110.4 | 26.4 | 3.52 | 2.9 | 2.19 | 35.7 | 78.9 | 0.74 |
| 6154 | 119.4 | 29.5 | 3.52 | 3.3 | 2.53 | 37.9 | 100.2 | 0.92 |

| Element | Mn | Mo | Na | Nb | Ni | P | Pb | Rb |
|---|---|---|---|---|---|---|---|---|
| LDL | 1 | 0.1 | 0.001 | 0.1 | 0.1 | 0.001 | 0.1 | 0.1 |
| Samples | ppm | ppm | % | ppm | ppm | % | ppm | ppm |
| 6088 | 273 | 2.2 | 0.391 | 11.4 | 43.4 | 0.078 | 20.1 | 125.8 |
| 6089 | 260 | 2.2 | 0.467 | 10.4 | 42.4 | 0.077 | 19.2 | 101.7 |
| 6090 | 314 | 1.9 | 0.451 | 12.7 | 38.5 | 0.096 | 19.9 | 128 |
| 6091 | 162 | 32.3 | 0.651 | 10.4 | 71.8 | 0.162 | 20.3 | 69.5 |
| 6094 | 280 | 88.2 | 0.825 | 9.1 | 252.7 | 0.34 | 16.8 | 45 |
| 6122 | 232 | 149.8 | 0.638 | 8.3 | 264.4 | 0.439 | 18.3 | 58.5 |
| 6125 | 244 | 139.9 | 0.443 | 8.1 | 166.1 | 0.08 | 16.9 | 71.5 |
| 6128 | 236 | 122.5 | 0.597 | 9 | 168.3 | 0.122 | 20.1 | 77.8 |
| 6133 | 161 | 109.8 | 0.497 | 8.6 | 184.9 | 0.079 | 19 | 82 |
| 6135 | 144 | 77.9 | 0.559 | 9.6 | 178 | 0.32 | 20.5 | 86.6 |
| 6136 | 286 | 40.1 | 0.625 | 9.1 | 78.6 | 0.081 | 29.2 | 65.2 |
| 6137 | 143 | 18.7 | 0.549 | 10.2 | 50.9 | 0.225 | 18.3 | 92.2 |
| 6140 | 164 | 5.8 | 0.436 | 12.1 | 45.5 | 0.13 | 21.1 | 128.6 |
| 6141 | 159 | 1.8 | 0.467 | 12.3 | 35.4 | 0.419 | 21.2 | 116.9 |
| 6142 | 1474 | 35 | 0.191 | 5 | 65.8 | 0.094 | 11.3 | 48.9 |
| 6145 | 172 | 65.6 | 0.31 | 9.9 | 102.3 | 0.084 | 15.9 | 112 |
| 6151 | 277 | 6.5 | 0.193 | 2.4 | 26.7 | 0.362 | 11.5 | 24 |
| 6153 | 126 | 4.1 | 0.426 | 12.3 | 39.5 | 0.083 | 17.4 | 119.5 |
| 6154 | 156 | 2.2 | 0.494 | 13.8 | 39.1 | 0.08 | 23.5 | 134.7 |

| Element | S | Sb | Sc | Sn | Sr | Ta | Th | Ti |
|---|---|---|---|---|---|---|---|---|
| LDL | 0.1 | 0.1 | 1 | 0.1 | 1 | 0.1 | 0.1 | 0.01 |
| Samples | % | ppm | ppm | ppm | ppm | ppm | ppm | % |
| 6088 | 0.7 | 1.6 | 14 | 2.1 | 150 | 0.7 | 9.7 | 0.458 |
| 6089 | 0.9 | 1.3 | 11 | 2.1 | 169 | 0.7 | 7.8 | 0.416 |
| 6090 | 0.6 | 1.4 | 15 | 2.2 | 167 | 0.8 | 10 | 0.464 |
| 6091 | 3.4 | 6.2 | 8 | 2.2 | 363 | 0.7 | 6.8 | 0.329 |
| 6094 | 6.6 | 32.2 | 11 | 1.6 | 385 | 0.5 | 5.7 | 0.292 |
| 6122 | 4.9 | 20.9 | 10 | 2.3 | 522 | 0.5 | 11.8 | 0.198 |
| 6125 | 3.5 | 15.2 | 9 | 2 | 240 | 0.6 | 7 | 0.256 |
| 6128 | 3.6 | 18.4 | 10 | 1.8 | 307 | 0.6 | 8.1 | 0.283 |
| 6133 | 3.7 | 19 | 9 | 1.6 | 240 | 0.5 | 7 | 0.271 |
| 6135 | 4.2 | 16.4 | 12 | 1.8 | 288 | 0.6 | 10.4 | 0.283 |
| 6136 | 3.3 | 18.8 | 11 | 3 | 247 | 0.9 | 14 | 0.267 |
| 6137 | 2.1 | 5.4 | 10 | 2 | 180 | 0.7 | 9.8 | 0.303 |
| 6140 | 1.4 | 2 | 13 | 2.6 | 175 | 0.8 | 10.6 | 0.405 |
| 6141 | 1 | 1.1 | 15 | 2.3 | 227 | 0.8 | 15.2 | 0.405 |
| 6142 | 3 | 3 | 6 | 1.3 | 170 | 0.4 | 3.9 | 0.15 |
| 6145 | 5.2 | 4.7 | 11 | 2 | 175 | 0.6 | 7.9 | 0.306 |
| 6151 | 1.7 | 2.1 | 3 | 0.4 | 224 | 0.1 | 4.5 | 0.074 |
| 6153 | 1.7 | 1.1 | 13 | 2.4 | 149 | 0.8 | 11 | 0.468 |
| 6154 | 1.5 | 1.1 | 14 | 2.8 | 169 | 0.9 | 13.2 | 0.464 |

***Analysis: GROUP 4B - REE - 0.200 GM***

| **Element** | **U** | **V** | **W** | **Y** | **Zn** | **Zr** | **Ce** | **Co** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **1** | **0.1** | **0.1** | **1** | **0.1** | **0.5** | **0.5** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **6088** | 3.8 | 252 | 1.1 | 20.4 | 151 | 87.9 | 74.1 | 14.2 |
| **6089** | 2.9 | 223 | 1 | 14.4 | 143 | 79.1 | 62.7 | 17.3 |
| **6090** | 3.4 | 265 | 1.3 | 24.2 | 157 | 101.2 | 73.9 | 13.8 |
| **6091** | 12.2 | 611 | 1.4 | 29.6 | 193 | 98.3 | 69.9 | 14.2 |
| **6094** | 49.7 | 743 | 1.4 | 59.6 | 481 | 114.9 | 98.7 | 33 |
| **6122** | 67.2 | 771 | 1 | 78.1 | 458 | 93.5 | 125.7 | 26.2 |
| **6125** | 25.5 | 854 | 1.2 | 26.9 | 312 | 97.2 | 54.7 | 13.9 |
| **6128** | 25.8 | 696 | 1 | 30.6 | 323 | 98.2 | 62.4 | 13 |
| **6133** | 21.3 | 1275 | 1 | 28 | 395 | 77.4 | 56.2 | 13.8 |
| **6135** | 35.1 | 1057 | 1 | 78.8 | 461 | 88.8 | 105.7 | 20.5 |
| **6136** | 9.9 | 865 | 0.8 | 27.4 | 347 | 149.3 | 85.9 | 12.9 |
| **6137** | 11.7 | 408 | 1.1 | 50.5 | 174 | 86 | 90 | 12 |
| **6140** | 5.6 | 373 | 1.5 | 30.6 | 135 | 97.3 | 82.5 | 13.4 |
| **6141** | 11.2 | 347 | 1.4 | 91.6 | 116 | 106.9 | 148.3 | 12.1 |
| **6142** | 14.8 | 236 | 0.5 | 22.1 | 157 | 42.8 | 42.7 | 11 |
| **6145** | 18.9 | 359 | 1.1 | 20.9 | 258 | 64.8 | 68.3 | 16.6 |
| **6151** | 18.7 | 47 | 0.3 | 57.1 | 131 | 20.3 | 89.6 | 7.8 |
| **6153** | 5.1 | 209 | 1.3 | 20.2 | 121 | 86.3 | 82.9 | 11.1 |
| **6154** | 4.1 | 220 | 1.7 | 18.5 | 133 | 94.2 | 84.4 | 10.9 |

| **Element** | **Cs** | **Dy** | **Er** | **Eu** | **Ga** | **Gd** | **Hf** | **Ho** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.05** | **0.05** | **0.05** | **0.5** | **0.05** | **0.5** | **0.05** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **6088** | 10.7 | 4.64 | 2.87 | 1.2 | 22.2 | 5.47 | 4.2 | 1.01 |
| **6089** | 9.4 | 4.3 | 2.48 | 1.07 | 19.6 | 4.54 | 4.2 | 0.88 |
| **6090** | 10.3 | 5.12 | 2.78 | 1.18 | 20.2 | 4.83 | 4 | 1.07 |
| **6091** | 4.5 | 7.55 | 3.87 | 1.53 | 19.7 | 8.39 | 4.6 | 1.39 |
| **6094** | 2.6 | 11.75 | 5.88 | 2.31 | 15.7 | 12.62 | 4.4 | 2.29 |
| **6122** | 3.9 | 14.73 | 7.54 | 3.12 | 14.4 | 17.27 | 3.8 | 2.87 |
| **6125** | 5.3 | 4.72 | 2.75 | 1.17 | 14.5 | 5.15 | 3.3 | 0.93 |
| **6128** | 5.3 | 5.15 | 3.07 | 1.16 | 16 | 5.54 | 4.2 | 1.04 |
| **6133** | 5.9 | 4.88 | 2.78 | 1.11 | 15.8 | 5.59 | 3.4 | 0.97 |
| **6135** | 5.9 | 13.02 | 7.07 | 2.8 | 15.3 | 14.22 | 3.9 | 2.44 |
| **6136** | 4.3 | 5.96 | 2.9 | 1.05 | 21.4 | 6.92 | 7.2 | 1.04 |
| **6137** | 6 | 8.87 | 4.81 | 1.75 | 16.3 | 9.66 | 5.7 | 1.61 |
| **6140** | 10.2 | 5.85 | 3.49 | 1.44 | 20.9 | 6.52 | 5.3 | 1.18 |
| **6141** | 7.9 | 15.25 | 8.03 | 3.63 | 19.1 | 18.05 | 6.4 | 2.9 |
| **6142** | 3.5 | 4.07 | 2.33 | 0.84 | 9.8 | 4.14 | 1.7 | 0.8 |
| **6145** | 7.7 | 3.83 | 2.29 | 0.9 | 17 | 4.11 | 2.8 | 0.71 |
| **6151** | 0.6 | 8.52 | 3.73 | 2.34 | 3.7 | 10.56 | 5.1 | 1.36 |
| **6153** | 9.6 | 4.89 | 2.65 | 1.27 | 19.8 | 5.42 | 4.7 | 0.96 |
| **6154** | 9.4 | 4.55 | 2.73 | 1.17 | 21.5 | 5.54 | 4.8 | 0.85 |

| **Element** | **La** | **Lu** | **Nb** | **Nd** | **Pr** | **Sn** | **Rb** | **Sm** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.5** | **0.01** | **0.5** | **0.4** | **0.02** | **1** | **0.5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **6088** | 36.3 | 0.4 | 15.7 | 33.5 | 8.74 | 8 | 150.6 | 5.8 |
| **6089** | 31.9 | 0.35 | 13.7 | 30.5 | 7.48 | < 1 | 131.2 | 5.9 |
| **6090** | 34.8 | 0.39 | 14.5 | 31.8 | 8.59 | 7 | 129.1 | 5.8 |
| **6091** | 38 | 0.48 | 12.9 | 42.2 | 10.25 | < 1 | 78.3 | 8.6 |
| **6094** | 58.5 | 0.77 | 10.7 | 61.4 | 14.48 | < 1 | 48.8 | 13.2 |
| **6122** | 74.8 | 0.97 | 10.5 | 81.5 | 18.94 | < 1 | 62.4 | 17 |
| **6125** | 29.8 | 0.4 | 10.5 | 30.2 | 7.21 | < 1 | 69.3 | 5.6 |
| **6128** | 34.3 | 0.49 | 11.9 | 35.3 | 8.32 | < 1 | 77.8 | 6.5 |
| **6133** | 31.5 | 0.44 | 10.9 | 31.2 | 7.31 | < 1 | 80 | 5.9 |
| **6135** | 68.1 | 0.91 | 12 | 67.6 | 15.69 | 3 | 88.5 | 14.1 |
| **6136** | 41.3 | 0.43 | 11.4 | 43.9 | 10.57 | 49 | 62.8 | 8.4 |
| **6137** | 51.4 | 0.65 | 13.7 | 51.4 | 11.94 | < 1 | 93.9 | 10 |
| **6140** | 44.4 | 0.51 | 17.5 | 42.3 | 9.96 | 1 | 139.3 | 7.3 |
| **6141** | 84.3 | 0.99 | 16.5 | 84.6 | 20.25 | 7 | 118.6 | 17.4 |
| **6142** | 21.4 | 0.34 | 6.5 | 21.9 | 5.1 | < 1 | 51 | 3.9 |
| **6145** | 31.5 | 0.3 | 13.5 | 28 | 7.48 | < 1 | 114.4 | 5.1 |
| **6151** | 53.4 | 0.39 | 3.5 | 49.8 | 11.91 | < 1 | 23.8 | 10.6 |
| **6153** | 39.1 | 0.36 | 15.7 | 31.4 | 9.55 | 9 | 135 | 6.7 |
| **6154** | 41.9 | 0.4 | 17.5 | 35.1 | 9.48 | 2 | 138.8 | 6.3 |

| **Element** | **Sr** | **Ta** | **Tb** | **Th** | **Tm** | **U** | **V** | **W** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.5** | **0.1** | **0.01** | **0.1** | **0.05** | **0.1** | **5** | **0.1** |
| **Samples** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **6088** | 191 | 1.2 | 0.78 | 11.5 | 0.44 | 4.4 | 260 | 1.7 |
| **6089** | 180.2 | 0.9 | 0.74 | 9.8 | 0.43 | 3.4 | 230 | 1.6 |
| **6090** | 175.5 | 0.9 | 0.83 | 11.7 | 0.44 | 3.6 | 234 | 1.5 |
| **6091** | 475.1 | 0.9 | 1.26 | 10 | 0.56 | 12.5 | 612 | 1.8 |
| **6094** | 637.5 | 0.6 | 1.98 | 8.2 | 0.87 | 53.9 | 739 | 1.4 |
| **6122** | 594.1 | 0.6 | 2.63 | 13.3 | 1.13 | 72.9 | 832 | 0.9 |
| **6125** | 235 | 0.7 | 0.82 | 7.8 | 0.4 | 24.4 | 839 | 1.1 |
| **6128** | 328.4 | 0.8 | 0.87 | 9 | 0.42 | 24.6 | 692 | 1.2 |
| **6133** | 237.5 | 0.7 | 0.92 | 7.4 | 0.41 | 19.9 | 1172 | 1 |
| **6135** | 311.6 | 0.7 | 2.23 | 11.3 | 0.95 | 36.4 | 1026 | 1.4 |
| **6136** | 245.6 | 1 | 1.11 | 14 | 0.43 | 9.8 | 872 | 1.1 |
| **6137** | 177.9 | 0.9 | 1.62 | 11.5 | 0.67 | 11.6 | 406 | 1.1 |
| **6140** | 184.4 | 1.1 | 1.12 | 12.1 | 0.52 | 6.2 | 384 | 1.9 |
| **6141** | 223.4 | 1.1 | 2.77 | 17.1 | 1.07 | 12.1 | 338 | 1.8 |
| **6142** | 180.8 | 0.4 | 0.65 | 5.1 | 0.29 | 15 | 231 | 0.8 |
| **6145** | 183.9 | 0.7 | 0.65 | 10.3 | 0.33 | 19.3 | 345 | 1.6 |
| **6151** | 228.9 | 0.2 | 1.63 | 5.7 | 0.48 | 19.5 | 41 | 0.5 |
| **6153** | 179.3 | 1 | 0.84 | 12.6 | 0.43 | 5.9 | 215 | 1.6 |
| **6154** | 173.8 | 1.1 | 0.82 | 15.9 | 0.36 | 4.6 | 215 | 1.9 |

***Analysis: GROUP 4A - 0.200 GM***

| **Element** | **Y** | **Yb** | **Zr** | **Al2O3** | **Ba** | **CaO** | **Cr2O3** | **Cr2O3** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.1** | **0.05** | **0.5** | **0.03** | **5** | **0.01** | **0.001** | **0.001** |
| **Samples** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **%** | **%** | **%** |
| **6088** | 30.2 | 2.74 | 147.4 | 16.11 | 1059.2 | 0.66 | 0.014 | |
| **6089** | 27.2 | 2.88 | 141.5 | 16.05 | 925 | 0.72 | 0.013 | 0.013 |
| **6090** | 30.4 | 2.77 | 161 | 15.18 | 948.8 | 0.61 | 0.014 | |
| **6091** | 42.1 | 3.42 | 133.6 | 15.81 | 5388 | 1.2 | 0.015 | 0.0147 |
| **6094** | 70.4 | 5.35 | 157.7 | 13.22 | 12054 | 3.8 | 0.008 | 0.0077 |
| **6122** | 93.6 | 6.61 | 140.9 | 11.32 | 2818 | 8.26 | 0.009 | 0.0093 |
| **6125** | 29.7 | 2.43 | 125.8 | 10.92 | 579 | 12.02 | 0.009 | 0.0088 |
| **6128** | 34.5 | 3.04 | 142.2 | 12.18 | 1181 | 7.07 | 0.009 | 0.0087 |
| **6133** | 30.8 | 2.63 | 115.2 | 11.66 | 655 | 7.98 | 0.01 | 0.01 |
| **6135** | 87.7 | 5.91 | 153.8 | 11.79 | 1415 | 5.22 | 0.012 | 0.0115 |
| **6136** | 29.6 | 2.64 | 196.9 | 14.92 | 534 | 2.86 | 0.009 | 0.0092 |
| **6137** | 55.2 | 4.25 | 209.2 | 11.63 | 748 | 1.75 | 0.011 | 0.0111 |
| **6140** | 40 | 3.41 | 174.9 | 15.32 | 909 | 1.21 | 0.014 | 0.014 |
| **6141** | 103.5 | 6.76 | 233.6 | 14.62 | 935 | 1.66 | 0.013 | 0.0129 |
| **6142** | 26.1 | 2.17 | 61.5 | 6.91 | 360 | 30.34 | 0.005 | 0.0053 |
| **6145** | 24.8 | 2.24 | 95 | 12.62 | 648 | 5.14 | 0.01 | 0.01 |
| **6151** | 63.6 | 2.86 | 196.5 | 2.92 | 781 | 10.62 | 0.003 | 0.003 |
| **6153** | 30 | 2.59 | 150.3 | 15.78 | 759.2 | 0.8 | 0.013 | |
| **6154** | 27 | 2.75 | 152.2 | 16.98 | 780 | 0.4 | 0.014 | 0.0141 |

| **Element** | **Fe2O3** | **K2O** | **LOI** | **MgO** | **MnO** | **Na2O** | **Ni** | **P2O5** |
|---|---|---|---|---|---|---|---|---|
| **LDL** | **0.04** | **0.04** | **0.1** | **0.01** | **0.01** | **0.01** | **30** | **0.01** |
| **Samples** | **%** | **%** | **%** | **%** | **%** | **%** | **ppm** | **%** |
| **6088** | 4.97 | 2.84 | 9.1 | 1.59 | 0.03 | 0.59 | 34 | 0.2 |
| **6089** | 4.87 | 2.63 | 9.2 | 1.65 | 0.03 | 0.7 | 31 | 0.22 |
| **6090** | 4.57 | 2.68 | 7.8 | 1.49 | 0.04 | 0.6 | 34 | 0.2 |
| **6091** | 5.72 | 2.58 | 22.6 | 1.45 | 0.02 | 0.95 | 55 | 0.4 |
| **6094** | 8.07 | 1.84 | 26.2 | 1.18 | 0.04 | 1.2 | 115 | 0.86 |
| **6122** | 6.27 | 1.93 | 24.9 | 1.31 | 0.03 | 1.01 | 176 | 1.18 |
| **6125** | 4.75 | 1.65 | 26.5 | 1.68 | 0.03 | 0.59 | 86 | 0.17 |
| **6128** | 4.85 | 1.89 | 23.3 | 1.66 | 0.03 | 0.75 | 60 | 0.25 |
| **6133** | 4.65 | 1.9 | 25.8 | 1.53 | 0.02 | 0.66 | 84 | 0.19 |
| **6135** | 5.93 | 2.2 | 22.2 | 1.3 | 0.02 | 0.75 | 104 | 0.74 |
| **6136** | 4.81 | 1.51 | 20 | 2.9 | 0.03 | 0.79 | 66 | 0.17 |
| **6137** | 4.69 | 2.37 | 12 | 1.21 | 0.02 | 0.68 | 52 | 0.47 |
| **6140** | 4.32 | 2.81 | 11.4 | 1.46 | 0.02 | 0.57 | 58 | 0.28 |
| **6141** | 3.85 | 2.66 | 9 | 1.4 | 0.02 | 0.6 | 43 | 0.9 |
| **6142** | 4.44 | 1.23 | 30.6 | 1.31 | 0.17 | 0.2 | 49 | 0.2 |
| **6145** | 6.33 | 2.5 | 25.7 | 1.39 | 0.02 | 0.38 | 28 | 0.19 |
| **6151** | 3.94 | 1 | 8.9 | 1.57 | 0.03 | 0.25 | 36 | 0.8 |
| **6153** | 4.8 | 2.91 | 9.8 | 1.46 | 0.02 | 0.61 | 24 | 0.21 |
| **6154** | 4.93 | 2.87 | 9.9 | 1.56 | 0.02 | 0.61 | 46 | 0.17 |

|  |  |  |  |  |  |  | *Analysis: CO2* |  |
|---|---|---|---|---|---|---|---|---|
| **Element** | **Sc** | **SiO2** | **TiO2** | **TOT/C** | **TOT/S** | **SUM** | **C/ORG** | **C/GRA** |
| **LDL** | **1** | **0.02** | **0.01** | **0.01** | **0.01** |  |  |  |
| **Samples** | **ppm** | **%** | **%** | **%** | **%** | **%** | **%** | **%** |
| **6088** | 16 | 62.9 | 0.78 | 1.47 | 0.99 | 99.78 | 1.3 | 0.02 |
| **6089** | 15 | 62.34 | 0.76 | 1.31 | 0.92 | 99.29 | 1.11 | 0.06 |
| **6090** | 15 | 65.98 | 0.76 | 1.1 | 0.68 | 99.94 | 0.99 | < .02 |
| **6091** | 12 | 47.43 | 0.57 | 7.21 | 4.03 | 99.35 | 7.17 | 0.02 |
| **6094** | 13 | 41.2 | 0.51 | 6.66 | 5.66 | 99.48 | 6.42 | < .02 |
| **6122** | 12 | 42.69 | 0.4 | 11.89 | 5.63 | 99.65 | 10.82 | 0.04 |
| **6125** | 10 | 40.76 | 0.46 | 12.08 | 4.34 | 99.61 | 10.06 | 0.03 |
| **6128** | 11 | 47.08 | 0.5 | 9.79 | 4.59 | 99.71 | 8.66 | 0.05 |
| **6133** | 11 | 44.57 | 0.49 | 10.87 | 4.65 | 99.54 | 9.51 | 0.06 |
| **6135** | 14 | 48.72 | 0.53 | 9.31 | 5.53 | 99.58 | 8.72 | < .02 |
| **6136** | 12 | 51.21 | 0.46 | 5.99 | 3.96 | 99.74 | 5.63 | 0.03 |
| **6137** | 11 | 64.32 | 0.55 | 3.62 | 2.77 | 99.8 | 3.47 | < .02 |
| **6140** | 15 | 61.63 | 0.75 | 2.96 | 2.01 | 99.89 | 2.81 | 0.03 |
| **6141** | 17 | 64.16 | 0.74 | 1.85 | 1.42 | 99.73 | 1.76 | 0.03 |
| **6142** | 7 | 24.16 | 0.27 | 12.08 | 3.88 | 99.89 | 6.72 | 0.02 |
| **6145** | 12 | 44.83 | 0.54 | 9.82 | 5.81 | 99.73 | 9.11 | 0.02 |
| **6151** | 3 | 69.6 | 0.13 | 3.01 | 1.88 | 99.86 | 0.74 | 0.03 |
| **6153** | 15 | 62.53 | 0.78 | 2.13 | 2.05 | 99.71 | 2.03 | 0.03 |
| **6154** | 17 | 61.55 | 0.8 | 1.64 | 1.95 | 99.91 | 1.58 | 0.04 |

| **Element** | **CO2** | **SO4** |
|---|---|---|
| **LDL** |  |  |
| **Samples** | **%** | **%** |
| **6088** | 0.56 | 0.48 |
| **6089** | 0.48 | 0.27 |
| **6090** | 0.38 | 0.27 |
| **6091** | 0.07 | 0.59 |
| **6094** | 0.88 | 2.83 |
| **6122** | 3.78 | 4.01 |
| **6125** | 7.3 | 3.85 |
| **6128** | 3.96 | 3.51 |
| **6133** | 4.78 | 3.56 |
| **6135** | 2.15 | 4.3 |
| **6136** | 1.22 | 2.76 |
| **6137** | 0.5 | 1.6 |
| **6140** | 0.45 | 1.25 |
| **6141** | 0.22 | 0.48 |
| **6142** | 19.58 | 4.27 |
| **6145** | 2.52 | 6.73 |
| **6151** | 8.21 | 2.37 |
| **6153** | 0.27 | 0.52 |
| **6154** | 0.05 | 0.34 |

## 6.5 Precision and Accuracy Calculations

• *If less than 25% of values are <LDL, the value was set to 1/2 the LDL, if more than 25% of values are <LDL, then the value was not calculated*

*Diorite Gneiss Reference Material (SY-4)*
*Certified Values " 95% Confidence Interval*
•nng = 10-9 g/g (i.e.: ppb)

| **Element** | **Al2O3** | **CaO** | **CO2** | **Fe** | **Fe2O3 total** | **FeO** | **K2O** |
|---|---|---|---|---|---|---|---|
| **Values (%)** | 20.69 | 8.05 | 3.5 | 4.2 | 6.21 | 2.86 | 1.66 |
| **Plus/Minus (%)** | 0.08 | 0.04 | 0.1 | 0.1 | 0.03 | 0.09 | 0.02 |
|  | **MgO** | **MnO** | **Na2O** | **P2O5** | **SiO2** | **TiO2** | **LOI** |
|  | 0.54 | 0.108 | 7.1 | 0.131 | 49.9 | 0.287 | 4.56 |
|  | 0.01 | 0.001 | 0.05 | 0.004 | 0.1 | 0.003 | 0.07 |

| **Element** | **Ba** | **Be** | **Ce** | **Nd** | **Ni** | **Pb** | **Co** |
|---|---|---|---|---|---|---|---|
| **Values (ug/g)** | 340 | 2.6 | 122 | 57 | 9 | 10 | 2.8 |
| **Plus/Minus (ug/g)** | 5 | 0.1 | 2 | 1 | 1 | 1 | 0.2 |
|  | **Cr** | **Cs** | **Cu** | **Dy** | **Er** | **Eu** | **Ga** |
|  | 12 | 1.5 | 7 | 18.2 | 14.2 | 2 | 35 |
|  | 1 | 0.1 | 1 | 0.6 | 0.5 | 0.04 | 1 |
|  | **Gd** | **Hf** | **Ho** | **La** | **Li** | **Lu** | **Mn** |
|  | 14 | 10.6 | 4.3 | 58 | 37 | 2.1 | 819 |
|  | 0.5 | 0.4 | 0.1 | 1 | 2 | 0.1 | 24 |
|  | **Nb** | **Pr** | **Rb** | **Sc** | **Sm** | **Sr** | **Ta** |
|  | 13 | 15 | 55 | 1.1 | 12.7 | 1191 | 0.9 |
|  | 1 | 0.3 | 1.5 | 0.1 | 0.4 | 12 | 0.1 |
|  | **Tb** | **Th** | **Tm** | **U** | **V** | **Y** | **Yb** |
|  | 2.6 | 1.4 | 2.3 | 0.8 | 8 | 119 | 14.8 |
|  | 0.1 | 0.2 | 0.1 | 0.1 | 1.6 | 2 | 0.4 |
|  | **Zn** | **Zr** |  |  |  |  |  |
|  | 93 | 517 |  |  |  |  |  |
|  | 2 | 16 |  |  |  |  |  |

*Provisional Values " 95% Confidence Interval*

| **Element** | **Al** | **C** | **Ca** | **F** | **H2O+** | **H2O-** | **K** |
|---|---|---|---|---|---|---|---|
| **Values (%)** | 11 | 1 | 5.8 | 0.06 | 1 | 0.15 | 1.41 |
| **Plus/Minus (%)** | 1 | 0.1 | 0.3 | 0.01 | 0.3 | 0.05 | 0.03 |
|  | **Mg** | **Na** | **S total** |  |  |  |  |
|  | 0.3 | 5.3 | 0.015 |  |  |  |  |
|  | 0.02 | 0.2 | 0.004 |  |  |  |  |

| **Element** | **Ag** | **Br** | **P** | **Sn** |
|---|---|---|---|---|
| **Values (ug/g)** | 0.6 | 217 | 532 | 7.1 |
| **Plus/Minus (ug/g)** | 0.16 | 14 | 38 | 0.6 |

*Information Values (Range)*

| **Element** | **Cl** | **SO3** |
|---|---|---|
| **Values (%)** | 0.3 to 0.6 | 0.01 to 0.08 |
| **Average Value** | 0.45 | 0.045 |

| **Element** | **As** | **B** | **Bi** | **Cd** | **Ge** | **Hg** | **In** |
|---|---|---|---|---|---|---|---|
| **Values (ug/g)** | 0.1 to 2 | 13 to 18 | 0.1 to 0.3 | 0.1 to 2 | 1 to 4 | 10 to 14* | 0.04 to 0.1 |
| **Average Value** | 1.05 | 15.5 | 0.2 | 1.05 | 2.5 | 12 | 0.07 |
|  | **Mo** | **Sb** | **Se** | **Ti** | **Tl** | **W** |  |
|  | 0.2 to 3 | 0.01 to 0.3 | 0.01 to 4 | 1500 to 1750 | 0.2 to 0.5 | 0.2 to 15 |  |
|  | 1.6 | 0.155 | 2.005 | 1625 | 0.35 | 7.6 |  |

***Analysis: GROUP 1F1 - 1.00 GM, Standards***

| **ELEMENT** | **Analysis Date** | **Ag** | **Al** | **As** | **Au** | **B** |
|---|---|---|---|---|---|---|
| **SAMPLES** | | **ppb** | **%** | **ppm** | **ppb** | **ppm** |
| **SI** | | **10** | **0.02** | **0.1** | **0.2** | **2** |
| **LDL** | | **2** | **0.01** | **0.1** | **0.2** | **1** |
| | | | | | | |
| **212B PULP** | Dec. 2003 | 9 | 1.86 | < .1 | < .2 | 4 |
| **% Recovery** | | 0.539892 | 16.909091 | N/A | N/A | 25.806452 |
| **252B PULP** | Dec. 2003 | 6 | 1.8 | < .1 | 0.4 | 2 |
| **% Recovery** | | 0.359928 | 16.363636 | N/A | N/A | 12.903226 |
| **284B PULP** | Dec. 2003 | 3 | 1.74 | < .1 | < .2 | 5 |
| **% Recovery** | | 0.179964 | 15.818182 | N/A | N/A | 32.258065 |
| **312B PULP** | Dec. 2003 | 7 | 1.81 | < .1 | < .2 | 7 |
| **% Recovery** | | 0.419916 | 16.454545 | N/A | N/A | 45.16129 |
| **344B PULP** | Dec. 2003 | 4 | 1.75 | < .1 | < .2 | 4 |
| **% Recovery** | | 0.239952 | 15.909091 | N/A | N/A | 25.806452 |
| **375B PULP** | Dec. 2003 | 4 | 1.8 | < .1 | < .2 | 5 |
| **% Recovery** | | 0.239952 | 16.363636 | N/A | N/A | 32.258065 |
| **401B PULP** | Dec. 2003 | 5 | 1.79 | < .1 | < .2 | 3 |
| **% Recovery** | | 0.29994 | 16.272727 | N/A | N/A | 19.354839 |
| **429B PULP** | Dec. 2003 | 6 | 1.81 | < .1 | < .2 | 3 |
| **% Recovery** | | 0.359928 | 16.454545 | N/A | N/A | 19.354839 |
| **458B PULP** | Dec. 2003 | 5 | 1.68 | 0.2 | < .2 | 5 |
| **% Recovery** | | 0.29994 | 15.272727 | 19.047619 | N/A | 32.258065 |
| **484B PULP** | Dec. 2003 | 5 | 1.7 | < .1 | 0.3 | 5 |
| **% Recovery** | | 0.29994 | 15.454545 | N/A | N/A | 32.258065 |
| **3815B PULP** | Dec. 2003 | 4 | 1.83 | < .1 | < .2 | 3 |
| **% Recovery** | | 0.239952 | 16.636364 | N/A | N/A | 19.354839 |
| **3846B PULP** | Dec. 2003 | 7 | 1.66 | < .1 | < .2 | 4 |
| **% Recovery** | | 0.419916 | 15.090909 | N/A | N/A | 25.806452 |
| **3876B PULP** | Dec. 2003 | 9 | 1.78 | < .1 | < .2 | 4 |
| **% Recovery** | | 0.539892 | 16.181818 | N/A | N/A | 25.806452 |
| **3909B PULP** | Dec. 2003 | 8 | 1.72 | < .1 | < .2 | 5 |
| **% Recovery** | | 0.479904 | 15.636364 | N/A | N/A | 32.258065 |
| **3935B PULP** | Dec. 2003 | 6 | 1.79 | 0.1 | < .2 | 4 |
| **% Recovery** | | 0.359928 | 16.272727 | 9.5238095 | N/A | 25.806452 |
| **3960B PULP** | Dec. 2003 | 8 | 1.86 | < .1 | < .2 | 5 |
| **% Recovery** | | 0.479904 | 16.909091 | N/A | N/A | 32.258065 |
| **4534B PULP** | Dec. 2003 | 13 | 1.76 | < .1 | < .2 | 4 |
| **% Recovery** | | 0.779844 | 16 | N/A | N/A | 25.806452 |
| **4568B PULP** | Dec. 2003 | 4 | 1.71 | < .1 | < .2 | 5 |
| **% Recovery** | | 0.239952 | 15.545455 | N/A | N/A | 32.258065 |
| **6006B PULP** | Dec. 2003 | 7 | 1.75 | < .1 | < .2 | 5 |
| **% Recovery** | | 0.419916 | 15.909091 | N/A | N/A | 32.258065 |
| **6070B PULP** | Dec. 2003 | 8 | 1.84 | < .1 | < .2 | 5 |
| **% Recovery** | | 0.479904 | 16.727273 | N/A | N/A | 32.258065 |
| | | | | | | |
| **SY-4 Value** | | 1667 | 11 | 1.05 | N/A | 15.5 |
| | | | | | | |
| **Average % Recovery** | | 0.3839232 | 16.109091 | N/A | N/A | 28.064516 |
| | | | | | | |
| **RSD** | | 37.044936 | 3.2629824 | N/A | N/A | 25.044203 |
| | | | | | | |
| | | | | **Over 25% values <LDL** | **Over 25% values <LDL** | |

***Analysis: GROUP 1F1 - 1.00 GM, Standards***

| **ELEMENT** | **Ba** | **Bi** | **Ca** | **Cd** | **Co** | **Cr** | **Cu** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **7.5** | **0.03** | **0.39** | **0.01** | **0.1** | **0.7** | **1.15** |
| **LDL** | **0.5** | **0.02** | **0.01** | **0.01** | **0.1** | **0.5** | **0.01** |
| | | | | | | | |
| **212B PULP** | 183.2 | < .02 | 3.17 | 0.06 | 2 | 8.8 | 4.82 |
| **% Recovery** | 53.882353 | N/A | 54.655172 | 5.7142857 | 71.428571 | 73.333333 | 68.857143 |
| **252B PULP** | 188.2 | < .02 | 3.08 | 0.06 | 2.4 | 9.1 | 4.13 |
| **% Recovery** | 55.352941 | N/A | 53.103448 | 5.7142857 | 85.714286 | 75.833333 | 59 |
| **284B PULP** | 175.5 | < .02 | 3.02 | 0.07 | 2.2 | 8.5 | 4.86 |
| **% Recovery** | 51.617647 | N/A | 52.068966 | 6.6666667 | 78.571429 | 70.833333 | 69.428571 |
| **312B PULP** | 163.6 | < .02 | 2.89 | 0.05 | 2 | 8.2 | 4.84 |
| **% Recovery** | 48.117647 | N/A | 49.827586 | 4.7619048 | 71.428571 | 68.333333 | 69.142857 |
| **344B PULP** | 167.6 | < .02 | 2.96 | 0.04 | 1.7 | 7.7 | 4.53 |
| **% Recovery** | 49.294118 | N/A | 51.034483 | 3.8095238 | 60.714286 | 64.166667 | 64.714286 |
| **375B PULP** | 175.3 | < .02 | 3.09 | 0.07 | 1.9 | 7.9 | 4.32 |
| **% Recovery** | 51.558824 | N/A | 53.275862 | 6.6666667 | 67.857143 | 65.833333 | 61.714286 |
| **401B PULP** | 180.6 | < .02 | 2.74 | 0.05 | 2.1 | 8.3 | 4.1 |
| **% Recovery** | 53.117647 | N/A | 47.241379 | 4.7619048 | 75 | 69.166667 | 58.571429 |
| **429B PULP** | 180 | < .02 | 3.27 | 0.05 | 2.4 | 7.9 | 4.25 |
| **% Recovery** | 52.941176 | N/A | 56.37931 | 4.7619048 | 85.714286 | 65.833333 | 60.714286 |
| **458B PULP** | 173.8 | < .02 | 3.16 | 0.05 | 1.8 | 7.5 | 4.07 |
| **% Recovery** | 51.117647 | N/A | 54.482759 | 4.7619048 | 64.285714 | 62.5 | 58.142857 |
| **484B PULP** | 177.5 | < .02 | 3.2 | 0.06 | 2 | 8.2 | 4.48 |
| **% Recovery** | 52.205882 | N/A | 55.172414 | 5.7142857 | 71.428571 | 68.333333 | 64 |
| **3815B PULP** | 177.8 | < .02 | 3.1 | 0.06 | 2 | 7.8 | 4.79 |
| **% Recovery** | 52.294118 | N/A | 53.448276 | 5.7142857 | 71.428571 | 65 | 68.428571 |
| **3846B PULP** | 173.4 | < .02 | 3.07 | 0.05 | 2 | 7.8 | 4.12 |
| **% Recovery** | 51 | N/A | 52.931034 | 4.7619048 | 71.428571 | 65 | 58.857143 |
| **3876B PULP** | 188.7 | < .02 | 3.35 | 0.07 | 2.2 | 9 | 4.18 |
| **% Recovery** | 55.5 | N/A | 57.758621 | 6.6666667 | 78.571429 | 75 | 59.714286 |
| **3909B PULP** | 186.4 | < .02 | 3.23 | 0.06 | 2.1 | 8.3 | 4.97 |
| **% Recovery** | 54.823529 | N/A | 55.689655 | 5.7142857 | 75 | 69.166667 | 71 |
| **3935B PULP** | 180.9 | < .02 | 3.24 | 0.05 | 2.1 | 8.2 | 4.6 |
| **% Recovery** | 53.205882 | N/A | 55.862069 | 4.7619048 | 75 | 68.333333 | 65.714286 |
| **3960B PULP** | 177.9 | < .02 | 3.07 | 0.05 | 2.1 | 8.1 | 4.62 |
| **% Recovery** | 52.323529 | N/A | 52.931034 | 4.7619048 | 75 | 67.5 | 66 |
| **4534B PULP** | 170.5 | < .02 | 3.2 | 0.05 | 2.2 | 8.3 | 3.56 |
| **% Recovery** | 50.147059 | N/A | 55.172414 | 4.7619048 | 78.571429 | 69.166667 | 50.857143 |
| **4568B PULP** | 169.4 | < .02 | 2.85 | 0.06 | 1.9 | 7.8 | 4.8 |
| **% Recovery** | 49.823529 | N/A | 49.137931 | 5.7142857 | 67.857143 | 65 | 68.571429 |
| **6006B PULP** | 175.2 | < .02 | 2.81 | 0.05 | 2 | 8.8 | 4.07 |
| **% Recovery** | 51.529412 | N/A | 48.448276 | 4.7619048 | 71.428571 | 73.333333 | 58.142857 |
| **6070B PULP** | 170.7 | < .02 | 3.03 | 0.06 | 2.2 | 8.5 | 4.23 |
| **% Recovery** | 50.205882 | N/A | 52.241379 | 5.7142857 | 78.571429 | 70.833333 | 60.428571 |
| | | | | | | | |
| **SY-4 Value** | 340 | 0.2 | 5.8 | 1.05 | 2.8 | 12 | 7 |
| | | | | | | | |
| **Average % Recovery** | 52.002941 | N/A | 53.043103 | 5.3333333 | 73.75 | 68.625 | 63.1 |
| | | | | | | | |
| **RSD** | 3.8194 | N/A | 5.2668803 | 14.656834 | 8.500933 | 5.4059363 | 8.3675752 |
| | | | | | | | |
| | | Over 25%<br>values <LDL | | | | | |

***Analysis: GROUP 1F1 - 1.00 GM. Standards***

| **ELEMENT** | **Fe** | **Ga** | **Hg** | **K** | **La** | **Mg** | **Mn** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **%** | **ppm** | **ppb** | **%** | **ppm** | **%** | **ppm** |
| **SI** | **0.05** | **0.1** | **14** | **0.01** | **<.5** | **0.01** | **10** |
| **LDL** | **0.01** | **0.1** | **5** | **0.01** | **0.5** | **0.01** | **1** |
| **212B PULP** | 4.09 | 15 | 7 | 0.62 | 36.8 | 0.29 | 833 |
| **% Recovery** | 97.380952 | 42.857143 | 58.333333 | 43.971631 | 63.448276 | 96.666667 | 101.7094 |
| **252B PULP** | 4.06 | 15.8 | 7 | 0.59 | 37.2 | 0.28 | 806 |
| **% Recovery** | 96.666667 | 45.142857 | 58.333333 | 41.843972 | 64.137931 | 93.333333 | 98.412698 |
| **284B PULP** | 3.95 | 14.6 | 9 | 0.6 | 35.6 | 0.28 | 786 |
| **% Recovery** | 94.047619 | 41.714286 | 75 | 42.553191 | 61.37931 | 93.333333 | 95.970696 |
| **312B PULP** | 3.74 | 14.2 | < 5 | 0.58 | 32.9 | 0.27 | 755 |
| **% Recovery** | 89.047619 | 40.571429 | N/A | 41.134752 | 56.724138 | 90 | 92.185592 |
| **344B PULP** | 3.85 | 14.6 | < 5 | 0.59 | 31.5 | 0.27 | 775 |
| **% Recovery** | 91.666667 | 41.714286 | N/A | 41.843972 | 54.310345 | 90 | 94.627595 |
| **375B PULP** | 4.01 | 15.2 | < 5 | 0.64 | 31.9 | 0.29 | 834 |
| **% Recovery** | 95.47619 | 43.428571 | N/A | 45.390071 | 55 | 96.666667 | 101.8315 |
| **401B PULP** | 3.69 | 14.4 | < 5 | 0.59 | 35.4 | 0.26 | 719 |
| **% Recovery** | 87.857143 | 41.142857 | N/A | 41.843972 | 61.034483 | 86.666667 | 87.789988 |
| **429B PULP** | 4.03 | 15.1 | < 5 | 0.62 | 33.6 | 0.28 | 804 |
| **% Recovery** | 95.952381 | 43.142857 | N/A | 43.971631 | 57.931034 | 93.333333 | 98.168498 |
| **458B PULP** | 3.7 | 14.2 | < 5 | 0.57 | 34.2 | 0.26 | 747 |
| **% Recovery** | 88.095238 | 40.571429 | N/A | 40.425532 | 58.965517 | 86.666667 | 91.208791 |
| **484B PULP** | 3.79 | 14.4 | < 5 | 0.59 | 34.9 | 0.27 | 773 |
| **% Recovery** | 90.238095 | 41.142857 | N/A | 41.843972 | 60.172414 | 90 | 94.383394 |
| **3815B PULP** | 3.77 | 13.9 | < 5 | 0.57 | 34.8 | 0.27 | 771 |
| **% Recovery** | 89.761905 | 39.714286 | N/A | 40.425532 | 60 | 90 | 94.139194 |
| **3846B PULP** | 3.76 | 14.2 | < 5 | 0.59 | 34.2 | 0.27 | 747 |
| **% Recovery** | 89.52381 | 40.571429 | N/A | 41.843972 | 58.965517 | 90 | 91.208791 |
| **3876B PULP** | 4.02 | 15.2 | < 5 | 0.61 | 38 | 0.28 | 789 |
| **% Recovery** | 95.714286 | 43.428571 | N/A | 43.262411 | 65.517241 | 93.333333 | 96.336996 |
| **3909B PULP** | 3.93 | 14.4 | < 5 | 0.58 | 35.5 | 0.27 | 779 |
| **% Recovery** | 93.571429 | 41.142857 | N/A | 41.134752 | 61.206897 | 90 | 95.115995 |
| **3935B PULP** | 3.89 | 14.9 | 5 | 0.62 | 35.8 | 0.27 | 801 |
| **% Recovery** | 92.619048 | 42.571429 | 41.666667 | 43.971631 | 61.724138 | 90 | 97.802198 |
| **3960B PULP** | 3.83 | 15 | < 5 | 0.59 | 34.4 | 0.27 | 792 |
| **% Recovery** | 91.190476 | 42.857143 | N/A | 41.843972 | 59.310345 | 90 | 96.703297 |
| **4534B PULP** | 3.96 | 15 | < 5 | 0.61 | 35.1 | 0.27 | 795 |
| **% Recovery** | 94.285714 | 42.857143 | N/A | 43.262411 | 60.517241 | 90 | 97.069597 |
| **4568B PULP** | 3.74 | 13.6 | < 5 | 0.57 | 33.6 | 0.26 | 741 |
| **% Recovery** | 89.047619 | 38.857143 | N/A | 40.425532 | 57.931034 | 86.666667 | 90.47619 |
| **6006B PULP** | 3.82 | 14 | < 5 | 0.59 | 34.1 | 0.26 | 746 |
| **% Recovery** | 90.952381 | 40 | N/A | 41.843972 | 58.793103 | 86.666667 | 91.086691 |
| **6070B PULP** | 3.95 | 14.7 | < 5 | 0.62 | 35.6 | 0.27 | 764 |
| **% Recovery** | 94.047619 | 42 | N/A | 43.971631 | 61.37931 | 90 | 93.284493 |
| **SY-4 Value** | 4.2 | 35 | 12 | 1.41 | 58 | 0.3 | 819 |
| **Average % Recovery** | 92.357143 | 41.771429 | N/A | 42.340426 | 59.922414 | 90.666667 | 94.97558 |
| **RSD** | 3.2586671 | 3.6572589 | N/A | 3.310174 | 4.6838555 | 3.2883353 | 3.8932127 |
|  |  |  | Over 25%<br>values<br><LDL |  |  |  |  |

***Analysis: GROUP 1F1 - 1.00 GM. Standards***

| **ELEMENT** | **Mo** | **Na** | **Ni** | **P** | **Pb** | **S** | **Sb** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **%** | **ppm** | **%** | **ppm** | **%** | **ppm** |
| **SI** | **0.05** | **1.421** | **0.1** | **<.001** | **1.63** | **0.02** | **0.18** |
| **LDL** | **0.01** | **0.001** | **0.1** | **0.001** | **0.01** | **0.02** | **0.02** |
| **212B PULP** | 0.2 | 0.601 | 5.7 | 0.045 | 2.11 | < .01 | < .02 |
| **% Recovery** | 12.5 | 11.339623 | 63.333333 | 84.586466 | 21.1 | N/A | N/A |
| **252B PULP** | 0.19 | 0.58 | 5.7 | 0.046 | 2.19 | 0.03 | < .02 |
| **% Recovery** | 11.875 | 10.943396 | 63.333333 | 86.466165 | 21.9 | 200 | N/A |
| **284B PULP** | 0.19 | 0.561 | 4.9 | 0.047 | 2.01 | 0.01 | 0.05 |
| **% Recovery** | 11.875 | 10.584906 | 54.444444 | 88.345865 | 20.1 | 66.666667 | 32.258065 |
| **312B PULP** | 0.16 | 0.547 | 5 | 0.045 | 1.87 | 0.02 | < .02 |
| **% Recovery** | 10 | 10.320755 | 55.555556 | 84.586466 | 18.7 | 133.33333 | N/A |
| **344B PULP** | 0.16 | 0.591 | 4.4 | 0.044 | 1.84 | 0.01 | < .02 |
| **% Recovery** | 10 | 11.150943 | 48.888889 | 82.706767 | 18.4 | 66.666667 | N/A |
| **375B PULP** | 0.2 | 0.61 | 4.3 | 0.048 | 1.91 | < .01 | < .02 |
| **% Recovery** | 12.5 | 11.509434 | 47.777778 | 90.225564 | 19.1 | N/A | N/A |
| **401B PULP** | 0.18 | 0.559 | 5.4 | 0.049 | 1.92 | < .01 | < .02 |
| **% Recovery** | 11.25 | 10.54717 | 60 | 92.105263 | 19.2 | N/A | N/A |
| **429B PULP** | 0.17 | 0.611 | 5.6 | 0.047 | 1.93 | < .01 | < .02 |
| **% Recovery** | 10.625 | 11.528302 | 62.222222 | 88.345865 | 19.3 | N/A | N/A |
| **458B PULP** | 0.15 | 0.545 | 4.5 | 0.048 | 1.88 | < .01 | < .02 |
| **% Recovery** | 9.375 | 10.283019 | 50 | 90.225564 | 18.8 | N/A | N/A |
| **484B PULP** | 0.16 | 0.555 | 5.3 | 0.05 | 1.96 | < .01 | < .02 |
| **% Recovery** | 10 | 10.471698 | 58.888889 | 93.984962 | 19.6 | N/A | N/A |
| **3815B PULP** | 0.16 | 0.544 | 4.7 | 0.05 | 1.99 | < .01 | < .02 |
| **% Recovery** | 10 | 10.264151 | 52.222222 | 93.984962 | 19.9 | N/A | N/A |
| **3846B PULP** | 0.18 | 0.538 | 4.7 | 0.048 | 1.94 | < .01 | < .02 |
| **% Recovery** | 11.25 | 10.150943 | 52.222222 | 90.225564 | 19.4 | N/A | N/A |
| **3876B PULP** | 0.17 | 0.596 | 5.5 | 0.055 | 2.1 | < .01 | < .02 |
| **% Recovery** | 10.625 | 11.245283 | 61.111111 | 103.38346 | 21 | N/A | N/A |
| **3909B PULP** | 0.16 | 0.584 | 5.5 | 0.052 | 2 | < .01 | < .02 |
| **% Recovery** | 10 | 11.018868 | 61.111111 | 97.744361 | 20 | N/A | N/A |
| **3935B PULP** | 0.18 | 0.614 | 5.3 | 0.053 | 2.13 | < .01 | < .02 |
| **% Recovery** | 11.25 | 11.584906 | 58.888889 | 99.62406 | 21.3 | N/A | N/A |
| **3960B PULP** | 0.17 | 0.545 | 5.2 | 0.05 | 2.07 | < .01 | < .02 |
| **% Recovery** | 10.625 | 10.283019 | 57.777778 | 93.984962 | 20.7 | N/A | N/A |
| **4534B PULP** | 0.18 | 0.591 | 4.6 | 0.048 | 1.96 | < .01 | < .02 |
| **% Recovery** | 11.25 | 11.150943 | 51.111111 | 90.225564 | 19.6 | N/A | N/A |
| **4568B PULP** | 0.17 | 0.536 | 5 | 0.048 | 1.87 | < .01 | < .02 |
| **% Recovery** | 10.625 | 10.113208 | 55.555556 | 90.225564 | 18.7 | N/A | N/A |
| **6006B PULP** | 0.2 | 0.556 | 5.4 | 0.05 | 1.84 | < .01 | < .02 |
| **% Recovery** | 12.5 | 10.490566 | 60 | 93.984962 | 18.4 | N/A | N/A |
| **6070B PULP** | 0.22 | 0.553 | 6 | 0.052 | 1.97 | < .01 | < .02 |
| **% Recovery** | 13.75 | 10.433962 | 66.666667 | 97.744361 | 19.7 | N/A | N/A |
| **SY-4 Value** | 1.6 | 5.3 | 9 | 0.0532 | 10 | 0.015 | 0.155 |
| **Average % Recovery** | 11.09375 | 10.770755 | 57.055556 | 91.635338 | 19.745 | N/A | N/A |
| **RSD** | 10.156482 | 4.6806254 | 9.4409957 | 5.7971285 | 5.1135825 | N/A | N/A |
|  |  |  |  |  |  | Over 25% values <LDL | Over 25% values <LDL |

***Analysis: GROUP 1F1 - 1.00 GM, Standards***

| **ELEMENT** | **Sc** | **Se** | **Sr** | **Te** | **Th** | **Ti** | **Tl** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** |
| **SI** | **0.3** | **0.1** | **7.9** | **< .02** | **< .1** | **< .001** | **< .02** |
| **LDL** | **0.1** | **0.1** | **0.5** | **0.02** | **0.1** | **0.001** | **0.02** |
| | | | | | | | |
| **212B PULP** | 0.6 | *0.05* | 212.9 | 0.02 | 1 | 0.11 | 0.19 |
| **% Recovery** | 54.545455 | 2.4937656 | 17.875735 | N/A | 71.428571 | 67.692308 | 54.285714 |
| **252B PULP** | 0.8 | 0.2 | 213 | < .02 | 1 | 0.104 | 0.21 |
| **% Recovery** | 72.727273 | 9.9750623 | 17.884131 | N/A | 71.428571 | 64 | 60 |
| **284B PULP** | 0.7 | 0.2 | 202.9 | < .02 | 0.9 | 0.108 | 0.19 |
| **% Recovery** | 63.636364 | 9.9750623 | 17.036104 | N/A | 64.285714 | 66.461538 | 54.285714 |
| **312B PULP** | 0.7 | 0.1 | 198.2 | < .02 | 0.8 | 0.109 | 0.18 |
| **% Recovery** | 63.636364 | 4.9875312 | 16.641478 | N/A | 57.142857 | 67.076923 | 51.428571 |
| **344B PULP** | 0.6 | 0.1 | 204.7 | < .02 | 0.9 | 0.113 | 0.18 |
| **% Recovery** | 54.545455 | 4.9875312 | 17.187238 | N/A | 64.285714 | 69.538462 | 51.428571 |
| **375B PULP** | 0.5 | *0.05* | 214.9 | < .02 | 1.1 | 0.106 | 0.19 |
| **% Recovery** | 45.454545 | 2.4937656 | 18.043661 | N/A | 78.571429 | 65.230769 | 54.285714 |
| **401B PULP** | 0.7 | 0.1 | 206.2 | < .02 | 0.9 | 0.103 | 0.18 |
| **% Recovery** | 63.636364 | 4.9875312 | 17.313182 | N/A | 64.285714 | 63.384615 | 51.428571 |
| **429B PULP** | 0.7 | 0.3 | 217.5 | < .02 | 1.2 | 0.108 | 0.19 |
| **% Recovery** | 63.636364 | 14.962594 | 18.261965 | N/A | 85.714286 | 66.461538 | 54.285714 |
| **458B PULP** | 0.7 | 0.3 | 198.6 | < .02 | 0.9 | 0.102 | 0.18 |
| **% Recovery** | 63.636364 | 14.962594 | 16.675063 | N/A | 64.285714 | 62.769231 | 51.428571 |
| **484B PULP** | 0.7 | 0.4 | 201.8 | 0.02 | 1 | 0.114 | 0.18 |
| **% Recovery** | 63.636364 | 19.950125 | 16.943745 | N/A | 71.428571 | 70.153846 | 51.428571 |
| **3815B PULP** | 0.6 | 0.4 | 200.3 | < .02 | 0.8 | 0.108 | 0.18 |
| **% Recovery** | 54.545455 | 19.950125 | 16.8178 | N/A | 57.142857 | 66.461538 | 51.428571 |
| **3846B PULP** | 0.6 | 0.4 | 197.4 | < .02 | 0.9 | 0.106 | 0.18 |
| **% Recovery** | 54.545455 | 19.950125 | 16.574307 | N/A | 64.285714 | 65.230769 | 51.428571 |
| **3876B PULP** | 0.7 | 0.3 | 209.6 | < .02 | 1.3 | 0.111 | 0.2 |
| **% Recovery** | 63.636364 | 14.962594 | 17.598657 | N/A | 92.857143 | 68.307692 | 57.142857 |
| **3909B PULP** | 0.7 | 0.2 | 206 | < .02 | 0.9 | 0.11 | 0.19 |
| **% Recovery** | 63.636364 | 9.9750623 | 17.29639 | N/A | 64.285714 | 67.692308 | 54.285714 |
| **3935B PULP** | 0.7 | 0.4 | 208.1 | < .02 | 0.9 | 0.104 | 0.18 |
| **% Recovery** | 63.636364 | 19.950125 | 17.472712 | N/A | 64.285714 | 64 | 51.428571 |
| **3960B PULP** | 0.6 | 0.3 | 207.6 | < .02 | 0.9 | 0.107 | 0.18 |
| **% Recovery** | 54.545455 | 14.962594 | 17.43073 | N/A | 64.285714 | 65.846154 | 51.428571 |
| **4534B PULP** | 0.6 | 0.3 | 207.7 | < .02 | 1 | 0.108 | 0.18 |
| **% Recovery** | 54.545455 | 14.962594 | 17.439127 | N/A | 71.428571 | 66.461538 | 51.428571 |
| **4568B PULP** | 0.7 | 0.3 | 198.2 | < .02 | 1.1 | 0.1 | 0.18 |
| **% Recovery** | 63.636364 | 14.962594 | 16.641478 | N/A | 78.571429 | 61.538462 | 51.428571 |
| **6006B PULP** | 0.7 | 0.4 | 192 | 0.02 | 0.8 | 0.101 | 0.19 |
| **% Recovery** | 63.636364 | 19.950125 | 16.120907 | N/A | 57.142857 | 62.153846 | 54.285714 |
| **6070B PULP** | 0.7 | 0.5 | 208.5 | < .02 | 1 | 0.11 | 0.19 |
| **% Recovery** | 63.636364 | 24.937656 | 17.506297 | N/A | 71.428571 | 67.692308 | 54.285714 |
| | | | | | | | |
| **SY-4 Value** | 1.1 | 2.005 | 1191 | N/A | 1.4 | 0.1625 | 0.35 |
| | | | | | | | |
| **Average % Recovery** | 60.454545 | 13.216958 | 17.238035 | N/A | 68.928571 | 65.907692 | 53.142857 |
| | | | | | | | |
| **RSD** | 10.087525 | 50.516806 | 3.2296673 | N/A | 13.563488 | 3.595872 | 4.4128101 |
| | | 2 samples<br><LDL | | Over 25% values<br><LDL | | | |

***Analysis: GROUP 1F1 - 1.00 GM. Standards***

| **ELEMENT** | **U** | **V** | **W** | **Zn** |
|---|---|---|---|---|
| **SAMPLES** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **0.01** | **< 2** | **0.7** | **0.8** |
| **LDL** | **0.1** | **2** | **0.1** | **0.1** |
| | | | | |
| **212B PULP** | 0.34 | 5 | < .1 | 51.4 |
| **% Recovery** | 42.5 | 62.5 | N/A | 55.268817 |
| **252B PULP** | 0.37 | 5 | < .1 | 51 |
| **% Recovery** | 46.25 | 62.5 | N/A | 54.83871 |
| **284B PULP** | 0.36 | 5 | < .1 | 47.8 |
| **% Recovery** | 45 | 62.5 | N/A | 51.397849 |
| **312B PULP** | 0.3 | 6 | < .1 | 50.6 |
| **% Recovery** | 37.5 | 75 | N/A | 54.408602 |
| **344B PULP** | 0.4 | 6 | < .1 | 51.1 |
| **% Recovery** | 50 | 75 | N/A | 54.946237 |
| **375B PULP** | 0.33 | 6 | < .1 | 50.2 |
| **% Recovery** | 41.25 | 75 | N/A | 53.978495 |
| **401B PULP** | 0.37 | 5 | < .1 | 48.1 |
| **% Recovery** | 46.25 | 62.5 | N/A | 51.72043 |
| **429B PULP** | 0.52 | 5 | < .1 | 52.1 |
| **% Recovery** | 65 | 62.5 | N/A | 56.021505 |
| **458B PULP** | 0.35 | 4 | < .1 | 45.8 |
| **% Recovery** | 43.75 | 50 | N/A | 49.247312 |
| **484B PULP** | 0.39 | 5 | < .1 | 49.6 |
| **% Recovery** | 48.75 | 62.5 | N/A | 53.333333 |
| **3815B PULP** | 0.33 | 5 | < .1 | 47.1 |
| **% Recovery** | 41.25 | 62.5 | N/A | 50.645161 |
| **3846B PULP** | 0.46 | 5 | < .1 | 46.8 |
| **% Recovery** | 57.5 | 62.5 | N/A | 50.322581 |
| **3876B PULP** | 0.52 | 6 | < .1 | 50.1 |
| **% Recovery** | 65 | 75 | N/A | 53.870968 |
| **3909B PULP** | 0.35 | 5 | < .1 | 50.8 |
| **% Recovery** | 43.75 | 62.5 | N/A | 54.623656 |
| **3935B PULP** | 0.34 | 5 | < .1 | 50.4 |
| **% Recovery** | 42.5 | 62.5 | N/A | 54.193548 |
| **3960B PULP** | 0.41 | 5 | < .1 | 50.2 |
| **% Recovery** | 51.25 | 62.5 | N/A | 53.978495 |
| **4534B PULP** | 0.33 | 5 | < .1 | 50.2 |
| **% Recovery** | 41.25 | 62.5 | N/A | 53.978495 |
| **4568B PULP** | 0.39 | 5 | < .1 | 49.7 |
| **% Recovery** | 48.75 | 62.5 | N/A | 53.44086 |
| **6006B PULP** | 0.31 | 5 | < .1 | 49.7 |
| **% Recovery** | 38.75 | 62.5 | N/A | 53.44086 |
| **6070B PULP** | 0.35 | 5 | < .1 | 51.2 |
| **% Recovery** | 43.75 | 62.5 | N/A | 55.053763 |
| | | | | |
| **SY-4 Value** | 0.8 | 8 | 7.6 | 93 |
| | | | | |
| **Average % Recovery** | 47 | 64.375 | N/A | 53.435484 |
| | | | | |
| **RSD** | 16.381088 | 9.5021453 | N/A | 3.4089942 |
| | | | Over 25%<br>values<br><LDL | |

***Analysis: GROUP 1F1 - 1.00 GM, Standards***

| **ELEMENT** | **Analysis Date** | **Ag** | **Al** | **As** | **Au** | **B** |
|---|---|---|---|---|---|---|
| **SAMPLES** | | **ppb** | **%** | **ppm** | **ppb** | **ppm** |
| **SI** | | **4** | **<.01** | **<.1** | **0.6** | **1** |
| **LDL** | | **2** | **0.01** | **0.1** | **0.2** | **1** |
| **230B PULP** | Dec. 2003 | 6 | 1.75 | <.1 | <.2 | 6 |
| **% Recovery** | | 0.359928 | 15.909091 | N/A | N/A | 38.709677 |
| **253B PULP** | Dec. 2003 | 4 | 1.81 | <.1 | <.2 | 4 |
| **% Recovery** | | 0.239952 | 16.454545 | N/A | N/A | 25.806452 |
| **339B PULP** | Dec. 2003 | 6 | 1.78 | <.1 | 0.2 | 5 |
| **% Recovery** | | 0.359928 | 16.181818 | N/A | N/A | 32.258065 |
| **4549B PULP** | Dec. 2003 | 9 | 1.77 | <.1 | 0.4 | 4 |
| **% Recovery** | | 0.539892 | 16.090909 | N/A | N/A | 25.806452 |
| **4587B PULP** | Dec. 2003 | 7 | 1.74 | <.1 | 0.5 | 4 |
| **% Recovery** | | 0.419916 | 15.818182 | N/A | N/A | 25.806452 |
| **6094B PULP** | Dec. 2003 | 13 | 1.79 | <.1 | 0.9 | 5 |
| **% Recovery** | | 0.779844 | 16.272727 | N/A | N/A | 32.258065 |
| **6145B PULP** | Dec. 2003 | 9 | 1.8 | <.1 | <.2 | 4 |
| **% Recovery** | | 0.539892 | 16.363636 | N/A | N/A | 25.806452 |
| **4549B PULP** | March 2004 | | | | | |
| **% Recovery** | | | | | | |
| **SY-4 Value** | | 1667 | 11 | 1.05 | N/A | 15.5 |
| **Average % Recovery** | | 0.4627646 | 16.155844 | N/A | N/A | 29.493088 |
| **RSD** | | 37.95167 | 1.4424725 | N/A | N/A | 17.211158 |
| | | | | Over 25% values <LDL | Over 25% values <LDL | |

***Analysis: GROUP 1F1 - 1.00 GM, Standards***

| **ELEMENT** | **Ba** | **Be** | **Bi** | **Ca** | **Cd** | **Ce** |
|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **SI** | **2.4** | **< .1** | **< .02** | **0.09** | **< .01** | **< .1** |
| **LDL** | **0.5** | **0.1** | **0.02** | **0.01** | **0.01** | **0.1** |
| | | | | | | |
| **230B PULP** | 181.7 | 0.2 | < .02 | 3.11 | 0.05 | 72 |
| **% Recovery** | 53.44117647 | 7.6923077 | N/A | 53.62068966 | 4.7619048 | 59.016393 |
| **253B PULP** | 191.5 | 0.5 | < .02 | 3.26 | 0.05 | 78.6 |
| **% Recovery** | 56.32352941 | 19.230769 | N/A | 56.20689655 | 4.7619048 | 64.42623 |
| **339B PULP** | 193.3 | 0.2 | < .02 | 3.29 | 0.06 | 77 |
| **% Recovery** | 56.85294118 | 7.6923077 | N/A | 56.72413793 | 5.7142857 | 63.114754 |
| **4549B PULP** | 188.6 | 0.6 | < .02 | 3.22 | 0.06 | 78.3 |
| **% Recovery** | 55.47058824 | 23.076923 | N/A | 55.51724138 | 5.7142857 | 64.180328 |
| **4587B PULP** | 183.8 | 0.4 | < .02 | 3.15 | 0.05 | 77.1 |
| **% Recovery** | 54.05882353 | 15.384615 | N/A | 54.31034483 | 4.7619048 | 63.196721 |
| **6094B PULP** | 187.3 | 0.4 | < .02 | 3.26 | 0.06 | 77.8 |
| **% Recovery** | 55.08823529 | 15.384615 | N/A | 56.20689655 | 5.7142857 | 63.770492 |
| **6145B PULP** | 187.4 | 0.4 | < .02 | 3.3 | 0.07 | 85.5 |
| **% Recovery** | 55.11764706 | 15.384615 | N/A | 56.89655172 | 6.6666667 | 70.081967 |
| **4549B PULP** | | | | | | |
| **% Recovery** | | | | | | |
| | | | | | | |
| **SY-4 Value** | 340 | 2.6 | 0.2 | 5.8 | 1.05 | 122 |
| | | | | | | |
| **Average % Recovery** | 55.19327731 | 14.835165 | N/A | 55.64039409 | 5.4421769 | 63.969555 |
| | | | | | | |
| **RSD** | 2.154263844 | 37.95167 | N/A | 2.232468865 | 13.228757 | 5.0861885 |
| | | | Over 25%<br>values<br><LDL | | | |

***Analysis: GROUP 1F1 - 1.00 GM, Standards***

| **ELEMENT** | **Co** | **Cr** | **Cs** | **Cu** | **Fe** | **Ga** | **Ge** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **SI** | **<.1** | **<.5** | **0.01** | **1.41** | **0.02** | **<.1** | **<.1** |
| **LDL** | **0.1** | **0.5** | **0.02** | **0.01** | **0.01** | **0.1** | **0.1** |
| | | | | | | | |
| **230B PULP** | 2.1 | 8.3 | 1.38 | 3.34 | 3.89 | 14.2 | 0.1 |
| **% Recovery** | 75 | 69.166667 | 92 | 47.714286 | 92.619048 | 40.571429 | 4 |
| **253B PULP** | 2.2 | 8.5 | 1.42 | 3.48 | 4.04 | 14.9 | <.1 |
| **% Recovery** | 78.571429 | 70.833333 | 94.666667 | 49.714286 | 96.190476 | 42.571429 | N/A |
| **339B PULP** | 2.2 | 8.9 | 1.45 | 3.63 | 4.01 | 14.8 | <.1 |
| **% Recovery** | 78.571429 | 74.166667 | 96.666667 | 51.857143 | 95.47619 | 42.285714 | N/A |
| **4549B PULP** | 2 | 8.3 | 1.45 | 3.41 | 3.95 | 15 | <.1 |
| **% Recovery** | 71.428571 | 69.166667 | 96.666667 | 48.714286 | 94.047619 | 42.857143 | N/A |
| **4587B PULP** | 2.1 | 7.8 | 1.43 | 3.55 | 3.85 | 14.3 | <.1 |
| **% Recovery** | 75 | 65 | 95.333333 | 50.714286 | 91.666667 | 40.857143 | N/A |
| **6094B PULP** | 2 | 7.9 | 1.4 | 3.87 | 3.99 | 14.7 | <.1 |
| **% Recovery** | 71.428571 | 65.833333 | 93.333333 | 55.285714 | 95 | 42 | N/A |
| **6145B PULP** | 2.2 | 8.9 | 1.49 | 3.52 | 4.02 | 15.7 | 0.1 |
| **% Recovery** | 78.571429 | 74.166667 | 99.333333 | 50.285714 | 95.714286 | 44.857143 | 4 |
| **4549B PULP** | | | | | | | |
| **% Recovery** | | | | | | | |
| | | | | | | | |
| **SY-4 Value** | 2.8 | 12 | 1.5 | 7 | 4.2 | 35 | 2.5 |
| | | | | | | | |
| **Average % Recovery** | 75.510204 | 69.761905 | 95.428571 | 50.612245 | 94.387755 | 42.285714 | N/A |
| | | | | | | | |
| **RSD** | 4.2555053 | 5.1938097 | 2.5326502 | 4.8608365 | 1.7947007 | 3.3557803 | N/A |
| | | | | | | | Over 25% values <LDL |

***Analysis: GROUP 1F1 - 1.00 GM, Standards***

| **ELEMENT** | **Hf** | **Hg** | **In** | **K** | **La** | **Li** | **Mg** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **ppb** | **ppm** | **%** | **ppm** | **ppm** | **%** |
| **SI** | **< .02** | **< 5** | **< .02** | **< .01** | **< .5** | **0.1** | **< .01** |
| **LDL** | **0.02** | **5** | **0.02** | **0.01** | **0.5** | **0.1** | **0.01** |
| **230B PULP** | 0.05 | < 5 | 0.02 | 0.59 | 35.3 | 27 | 0.27 |
| **% Recovery** | 0.4716981 | N/A | 28.571429 | 41.843972 | 60.862069 | 72.972973 | 90 |
| **253B PULP** | 0.06 | < 5 | 0.02 | 0.62 | 36.3 | 28.1 | 0.28 |
| **% Recovery** | 0.5660377 | N/A | 28.571429 | 43.971631 | 62.586207 | 75.945946 | 93.333333 |
| **339B PULP** | 0.05 | < 5 | 0.03 | 0.62 | 36.7 | 29.3 | 0.28 |
| **% Recovery** | 0.4716981 | N/A | 42.857143 | 43.971631 | 63.275862 | 79.189189 | 93.333333 |
| **4549B PULP** | 0.04 | < 5 | 0.03 | 0.6 | 35.8 | 29.4 | 0.28 |
| **% Recovery** | 0.3773585 | N/A | 42.857143 | 42.553191 | 61.724138 | 79.459459 | 93.333333 |
| **4587B PULP** | 0.04 | 10 | 0.04 | 0.6 | 36.4 | 28 | 0.27 |
| **% Recovery** | 0.3773585 | 83.333333 | 57.142857 | 42.553191 | 62.758621 | 75.675676 | 90 |
| **6094B PULP** | 0.03 | < 5 | 0.03 | 0.61 | 35.9 | 28.8 | 0.28 |
| **% Recovery** | 0.2830189 | N/A | 42.857143 | 43.262411 | 61.896552 | 77.837838 | 93.333333 |
| **6145B PULP** | *0.01* | < 5 | 0.03 | 0.59 | 37.6 | 28.4 | 0.27 |
| **% Recovery** | 0.0943396 | N/A | 42.857143 | 41.843972 | 64.827586 | 76.756757 | 90 |
| **4549B PULP** | | | | | | | |
| **% Recovery** | | | | | | | |
| **SY-4 Value** | 10.6 | 12 | 0.07 | 1.41 | 58 | 37 | 0.3 |
| **Average % Recovery** | 0.3773585 | N/A | 40.816327 | 42.857143 | 62.561576 | 76.833977 | 91.904762 |
| **RSD** | 40.824829 | N/A | 24.152295 | 2.1056563 | 2.0340784 | 2.9340021 | 1.9386826 |
| | 1 value<br><LDL | Over 25% values<br><LDL | | | | | |

***Analysis: GROUP 1F1 - 1.00 GM, Standards***

| **ELEMENT** | **Mn** | **Mo** | **Na** | **Nb** | **Ni** | **P** | **Pb** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** |
| **SI** | **< 1** | **0.03** | **0.422** | **< .02** | **0.1** | **< .001** | **0.27** |
| **LDL** | **1** | **0.01** | **0.001** | **0.02** | **0.1** | **0.001** | **0.01** |
| | | | | | | | |
| **230B PULP** | 777 | 0.19 | 0.559 | 0.67 | 4.9 | 0.051 | 1.91 |
| **% Recovery** | 94.871795 | 11.875 | 10.54717 | 5.1538462 | 54.444444 | 95.864662 | 19.1 |
| **253B PULP** | 807 | 0.18 | 0.579 | 0.69 | 5.4 | 0.053 | 2.05 |
| **% Recovery** | 98.534799 | 11.25 | 10.924528 | 5.3076923 | 60 | 99.62406 | 20.5 |
| **339B PULP** | 801 | 0.21 | 0.583 | 0.67 | 5 | 0.053 | 2.05 |
| **% Recovery** | 97.802198 | 13.125 | 11 | 5.1538462 | 55.555556 | 99.62406 | 20.5 |
| **4549B PULP** | 791 | 0.21 | 0.583 | 0.78 | 5.6 | 0.052 | 2.02 |
| **% Recovery** | 96.581197 | 13.125 | 11 | 6 | 62.222222 | 97.744361 | 20.2 |
| **4587B PULP** | 764 | 0.17 | 0.577 | 0.83 | 5.1 | 0.052 | 1.99 |
| **% Recovery** | 93.284493 | 10.625 | 10.886792 | 6.3846154 | 56.666667 | 97.744361 | 19.9 |
| **6094B PULP** | 806 | 0.2 | 0.564 | 0.75 | 5.2 | 0.051 | 1.89 |
| **% Recovery** | 98.412698 | 12.5 | 10.641509 | 5.7692308 | 57.777778 | 95.864662 | 18.9 |
| **6145B PULP** | 780 | 0.27 | 0.573 | 0.76 | 6 | 0.054 | 2.2 |
| **% Recovery** | 95.238095 | 16.875 | 10.811321 | 5.8461538 | 66.666667 | 101.50376 | 22 |
| **4549B PULP** | | | | | | | |
| **% Recovery** | | | | | | | |
| | | | | | | | |
| **SY-4 Value** | 819 | 1.6 | 5.3 | 13 | 9 | 0.0532 | 10 |
| | | | | | | | |
| **Average % Recovery** | 96.389325 | 12.767857 | 10.830189 | 5.6593407 | 59.047619 | 98.281418 | 20.157143 |
| | | | | | | | |
| **RSD** | 2.0748463 | 15.95162 | 1.6249789 | 8.2996933 | 7.2414518 | 2.1281096 | 5.1225762 |

***Analysis: GROUP 1F1 - 1.00 GM, Standards***

| **ELEMENT** | **Pd** | **Pt** | **Rb** | **Re** | **S** | **Sb** | **Se** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **ppb** | **ppb** | **ppm** | **ppb** | **%** | **ppm** | **ppm** |
| **SI** | **< 10** | **< 2** | **0.1** | **< 1** | **0.01** | **0.14** | **< .1** |
| **LDL** | **10** | **2** | **0.1** | **1** | **0.02** | **0.02** | **0.1** |
| **230B PULP** | < 10 | < 2 | 41.8 | 3 | < .01 | < .02 | 0.6 |
| **% Recovery** | N/A | N/A | 76 | N/A | N/A | N/A | 54.545455 |
| **253B PULP** | < 10 | < 2 | 43.6 | 1 | < .01 | < .02 | 0.7 |
| **% Recovery** | N/A | N/A | 79.272727 | N/A | N/A | N/A | 63.636364 |
| **339B PULP** | < 10 | < 2 | 43.9 | 4 | < .01 | < .02 | 0.7 |
| **% Recovery** | N/A | N/A | 79.818182 | N/A | N/A | N/A | 63.636364 |
| **4549B PULP** | < 10 | < 2 | 44.2 | 2 | < .01 | < .02 | 0.8 |
| **% Recovery** | N/A | N/A | 80.363636 | N/A | N/A | N/A | 72.727273 |
| **4587B PULP** | < 10 | < 2 | 42.8 | < 1 | < .01 | < .02 | 0.8 |
| **% Recovery** | N/A | N/A | 77.818182 | N/A | N/A | N/A | 72.727273 |
| **6094B PULP** | < 10 | < 2 | 43.3 | 3 | < .01 | 0.02 | 0.7 |
| **% Recovery** | N/A | N/A | 78.727273 | N/A | N/A | 12.903226 | 63.636364 |
| **6145B PULP** | < 10 | < 2 | 45.2 | < 1 | < .01 | < .02 | 0.7 |
| **% Recovery** | N/A | N/A | 82.181818 | N/A | N/A | N/A | 63.636364 |
| **4549B PULP** | | | | | | | |
| **% Recovery** | | | | | | | |
| **SY-4 Value** | N/A | N/A | 55 | N/A | 0.015 | 0.155 | 1.1 |
| **Average % Recovery** | N/A | N/A | 79.168831 | N/A | N/A | N/A | 64.935065 |
| **RSD** | N/A | N/A | 2.4729931 | N/A | N/A | N/A | 9.6609178 |
| | Over 25% values <LDL | Over 25% values <LDL | | Over 25% values <LDL | Over 25% values <LDL | Over 25% values <LDL | |

***Analysis: GROUP 1F1 - 1.00 GM, Standards***

| **ELEMENT** | **Se** | **Sn** | **Sr** | **Ta** | **Te** | **Th** | **Ti** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **SI** | **<.1** | **<.1** | **2.1** | **<.05** | **<.02** | **<.1** | **0.001** |
| **LDL** | **0.1** | **0.1** | **0.5** | **0.05** | **0.02** | **0.1** | **0.001** |
| **230B PULP** | 0.3 | 6.4 | 203.5 | < .05 | < .02 | 0.9 | 0.108 |
| **% Recovery** | 14.962594 | 90.140845 | 17.086482 | N/A | N/A | 64.285714 | 66.461538 |
| **253B PULP** | 0.4 | 6.8 | 212.6 | < .05 | < .02 | 1.1 | 0.117 |
| **% Recovery** | 19.950125 | 95.774648 | 17.850546 | N/A | N/A | 78.571429 | 72 |
| **339B PULP** | 0.3 | 7 | 212.3 | < .05 | < .02 | 0.9 | 0.118 |
| **% Recovery** | 14.962594 | 98.591549 | 17.825357 | N/A | N/A | 64.285714 | 72.615385 |
| **4549B PULP** | 0.2 | 6.2 | 209.4 | < .05 | < .02 | 1 | 0.109 |
| **% Recovery** | 9.9750623 | 87.323944 | 17.581864 | N/A | N/A | 71.428571 | 67.076923 |
| **4587B PULP** | 0.3 | 6.7 | 202.3 | < .05 | < .02 | 1.2 | 0.118 |
| **% Recovery** | 14.962594 | 94.366197 | 16.985726 | N/A | N/A | 85.714286 | 72.615385 |
| **6094B PULP** | 0.2 | 6.5 | 209.1 | < .05 | < .02 | 0.9 | 0.123 |
| **% Recovery** | 9.9750623 | 91.549296 | 17.556675 | N/A | N/A | 64.285714 | 75.692308 |
| **6145B PULP** | 0.5 | 7.2 | 205.2 | < .05 | < .02 | 1 | 0.11 |
| **% Recovery** | 24.937656 | 101.40845 | 17.229219 | N/A | N/A | 71.428571 | 67.692308 |
| **4549B PULP** |  |  |  |  |  |  |  |
| **% Recovery** |  |  |  |  |  |  |  |
| **SY-4 Value** | 2.005 | 7.1 | 1191 | 0.9 | N/A | 1.4 | 0.1625 |
| **Average % Recovery** | 15.675098 | 94.16499 | 17.445124 | N/A | N/A | 71.428571 | 70.593407 |
| **RSD** | 34.015067 | 5.2120987 | 1.9944788 | N/A | N/A | 11.547005 | 4.9750895 |
|  |  |  |  | Over 25% values <LDL | Over 25% values <LDL |  |  |

***Analysis: GROUP 1F1 - 1.00 GM, Standards***

| **ELEMENT** | **Tl** | **U** | **V** | **W** | **Y** | **Zn** | **Zr** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **< .02** | **< .01** | **< 2** | **< .1** | **0.02** | **0.5** | **0.3** |
| **LDL** | **0.02** | **0.1** | **2** | **0.1** | **0.01** | **0.1** | **0.1** |
| **230B PULP** | 0.19 | 0.33 | 4 | < .1 | 104.6 | 50.2 | 1.5 |
| **% Recovery** | 54.285714 | 41.25 | 50 | N/A | 87.89916 | 53.978495 | 0.2901354 |
| **253B PULP** | 0.19 | 0.42 | 5 | < .1 | 106.93 | 49.4 | 1.7 |
| **% Recovery** | 54.285714 | 52.5 | 62.5 | N/A | 89.857143 | 53.11828 | 0.3288201 |
| **339B PULP** | 0.19 | 0.36 | 5 | < .1 | 105.03 | 52.3 | 1.5 |
| **% Recovery** | 54.285714 | 45 | 62.5 | N/A | 88.260504 | 56.236559 | 0.2901354 |
| **4549B PULP** | 0.19 | 0.36 | 5 | < .1 | 105.19 | 50.2 | 1.7 |
| **% Recovery** | 54.285714 | 45 | 62.5 | N/A | 88.394958 | 53.978495 | 0.3288201 |
| **4587B PULP** | 0.2 | 0.34 | 5 | < .1 | 104.36 | 49.6 | 1.7 |
| **% Recovery** | 57.142857 | 42.5 | 62.5 | N/A | 87.697479 | 53.333333 | 0.3288201 |
| **6094B PULP** | 0.2 | 0.39 | 5 | < .1 | 105.93 | 52 | 1.6 |
| **% Recovery** | 57.142857 | 48.75 | 62.5 | N/A | 89.016807 | 55.913978 | 0.3094778 |
| **6145B PULP** | 0.2 | 0.35 | 5 | < .1 | 100.26 | 48.4 | 1.8 |
| **% Recovery** | 57.142857 | 43.75 | 62.5 | N/A | 84.252101 | 52.043011 | 0.3481625 |
| **4549B PULP** | | | | | | | |
| **% Recovery** | | | | | | | |
| **SY-4 Value** | 0.35 | 0.8 | 8 | 7.6 | 119 | 93 | 517 |
| **Average % Recovery** | 55.510204 | 45.535714 | 60.714286 | N/A | 87.911164 | 54.086022 | 0.3177673 |
| **RSD** | 2.7512187 | 8.5138089 | 7.7816215 | N/A | 2.0135313 | 2.7903914 | 6.9019599 |
| | | | | Over 25% values <LDL | | | |

***Analysis: GROUP 1EX - 0.25 GM, Standards***

| **ELEMENT** | **Ag** | **Al** | **As** | **Au** | **Ba** | **Be** | **Bi** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **< .1** | **0.89** | **< 1** | **< .1** | **145** | **< 1** | **< .1** |
| **LDL** | **0.1** | **0.01** | **1** | **0.1** | **1** | **1** | **0.1** |
| **230B PULP** | < .1 | 9.53 | 2 | < .1 | 306 | 5 | < .1 |
| **% Recovery** | N/A | 86.636364 | 190.47619 | N/A | 90 | 192.30769 | N/A |
| **253B PULP** | < .1 | 9.48 | 2 | < .1 | 319 | 3 | < .1 |
| **% Recovery** | N/A | 86.181818 | 190.47619 | N/A | 93.823529 | 115.38462 | N/A |
| **339B PULP** | < .1 | 9.1 | 2 | < .1 | 298 | 2 | < .1 |
| **% Recovery** | N/A | 82.727273 | 190.47619 | N/A | 87.647059 | 76.923077 | N/A |
| **4549B PULP** | < .1 | 8.84 | 2 | < .1 | 290 | 3 | < .1 |
| **% Recovery** | N/A | 80.363636 | 190.47619 | N/A | 85.294118 | 115.38462 | N/A |
| **4587B PULP** | < .1 | 8.78 | 3 | < .1 | 244 | 2 | < .1 |
| **% Recovery** | N/A | 79.818182 | 285.71429 | N/A | 71.764706 | 76.923077 | N/A |
| **6094B PULP** | < .1 | 8.77 | 1 | < .1 | 275 | 3 | < .1 |
| **% Recovery** | N/A | 79.727273 | 95.238095 | N/A | 80.882353 | 115.38462 | N/A |
| **6145B PULP** | < .1 | 8.86 | 2 | < .1 | 299 | 3 | < .1 |
| **% Recovery** | N/A | 80.545455 | 190.47619 | N/A | 87.941176 | 115.38462 | N/A |
| **4549B PULP** | < .1 | 8.23 | 2 | < .1 | 368 | 3 | < .1 |
| **% Recovery** | N/A | 74.818182 | 190.47619 | N/A | 108.23529 | 115.38462 | N/A |
| **SY-4 Value** | 0.6 | 11 | 1.05 | N/A | 340 | 2.6 | 0.2 |
| **Average % Recovery** | N/A | 81.352273 | 190.47619 | N/A | 88.198529 | 115.38462 | N/A |
| **RSD** | N/A | 4.7026723 | 26.726124 | N/A | 11.881883 | 30.86067 | N/A |
|  | Over 25% values <LDL |  |  | Over 25% values <LDL |  |  | Over 25% values <LDL |

***Analysis: GROUP 1EX - 0.25 GM, Standards***

| **ELEMENT** | **Ca** | **Cd** | **Ce** | **Co** | **Cr** | **Cu** | **Fe** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **SI** | **7.19** | **0.2** | **3** | **< 1** | **0.1** | **4.5** | **0.07** |
| **LDL** | **0.01** | **0.1** | **1** | **1** | **0.1** | **0.1** | **0.01** |
| | | | | | | | |
| **230B PULP** | 5.36 | 0.1 | 84 | 2 | 10.4 | 3.9 | 4.18 |
| **% Recovery** | 92.413793 | 9.5238095 | 68.852459 | 71.428571 | 86.666667 | 55.714286 | 99.52381 |
| **253B PULP** | 5.23 | 0.1 | 91 | 2 | 9.5 | 3.5 | 4.3 |
| **% Recovery** | 90.172414 | 9.5238095 | 74.590164 | 71.428571 | 79.166667 | 50 | 102.38095 |
| **339B PULP** | 5.2 | 0.1 | 81 | 1 | 8.5 | 3.3 | 4.3 |
| **% Recovery** | 89.655172 | 9.5238095 | 66.393443 | 35.714286 | 70.833333 | 47.142857 | 102.38095 |
| **4549B PULP** | 5.13 | 0.2 | 68 | 1 | 11.7 | 4.4 | 4.22 |
| **% Recovery** | 88.448276 | 19.047619 | 55.737705 | 35.714286 | 97.5 | 62.857143 | 100.47619 |
| **4587B PULP** | 5.08 | 0.1 | 58 | 1 | 11 | 3.9 | 4 |
| **% Recovery** | 87.586207 | 9.5238095 | 47.540984 | 35.714286 | 91.666667 | 55.714286 | 95.238095 |
| **6094B PULP** | 5 | 0.1 | 64 | 1 | 11.7 | 3.9 | 3.97 |
| **% Recovery** | 86.206897 | 9.5238095 | 52.459016 | 35.714286 | 97.5 | 55.714286 | 94.52381 |
| **6145B PULP** | 5.29 | 0.05 | 71 | 2 | 10.5 | 4.7 | 4.14 |
| **% Recovery** | 91.206897 | 4.7619048 | 58.196721 | 71.428571 | 87.5 | 67.142857 | 98.571429 |
| **4549B PULP** | 5.88 | 0.1 | 121 | 4 | 7 | 4.1 | 4.45 |
| **% Recovery** | 101.37931 | 9.5238095 | 99.180328 | 142.85714 | 58.333333 | 58.571429 | 105.95238 |
| | | | | | | | |
| **SY-4 Value** | 5.8 | 1.05 | 122 | 2.8 | 12 | 7 | 4.2 |
| | | | | | | | |
| **Average % Recovery** | 90.883621 | 10.119048 | 65.368852 | 62.5 | 83.645833 | 56.607143 | 99.880952 |
| | | | | | | | |
| **RSD** | 5.1490922 | 39.271669 | 25.004369 | 59.148477 | 16.274188 | 11.361473 | 3.8183188 |
| | | 1 value<br><LDL | | | | | |

***Analysis: GROUP 1EX - 0.25 GM. Standards***

| **ELEMENT** | **Hf** | **K** | **La** | **Li** | **Mg** | **Mn** | **Mo** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **SI** | **0.6** | **0.19** | **2** | **1.8** | **0.14** | **17** | **0.4** |
| **LDL** | **0.1** | **0.01** | **0.1** | **0.1** | **0.01** | **1** | **0.1** |
| **230B PULP** | 0.7 | 1.24 | 34.9 | 38 | 0.26 | 876 | 0.2 |
| **% Recovery** | 6.6037736 | 87.943262 | 60.172414 | 102.7027 | 86.666667 | 106.95971 | 12.5 |
| **253B PULP** | 1.1 | 1.24 | 35.9 | 36.1 | 0.26 | 854 | 0.1 |
| **% Recovery** | 10.377358 | 87.943262 | 61.896552 | 97.567568 | 86.666667 | 104.2735 | 6.25 |
| **339B PULP** | 0.9 | 1.23 | 29.4 | 34.8 | 0.25 | 850 | 0.2 |
| **% Recovery** | 8.490566 | 87.234043 | 50.689655 | 94.054054 | 83.333333 | 103.7851 | 12.5 |
| **4549B PULP** | 0.8 | 1.25 | 32 | 37.5 | 0.24 | 872 | 0.2 |
| **% Recovery** | 7.5471698 | 88.652482 | 55.172414 | 101.35135 | 80 | 106.47131 | 12.5 |
| **4587B PULP** | 0.8 | 1.26 | 25.7 | 31.4 | 0.22 | 811 | 0.2 |
| **% Recovery** | 7.5471698 | 89.361702 | 44.310345 | 84.864865 | 73.333333 | 99.023199 | 12.5 |
| **6094B PULP** | 1 | 1.22 | 29.4 | 39.7 | 0.24 | 803 | 0.2 |
| **% Recovery** | 9.4339623 | 86.524823 | 50.689655 | 107.2973 | 80 | 98.046398 | 12.5 |
| **6145B PULP** | 1 | 1.27 | 32.6 | 36.3 | 0.25 | 863 | 0.1 |
| **% Recovery** | 9.4339623 | 90.070922 | 56.206897 | 98.108108 | 83.333333 | 105.37241 | 6.25 |
| **4549B PULP** | 1.1 | 1.37 | 65 | 38.8 | 0.23 | 902 | 0.2 |
| **% Recovery** | 10.377358 | 97.163121 | 112.06897 | 104.86486 | 76.666667 | 110.13431 | 12.5 |
| **SY-4 Value** | 10.6 | 1.41 | 58 | 37 | 0.3 | 819 | 1.6 |
| **Average % Recovery** | 8.7264151 | 89.361702 | 61.400862 | 98.851351 | 81.25 | 104.25824 | 10.9375 |
| **RSD** | 16.087001 | 3.7466466 | 34.583391 | 7.1472592 | 5.7759424 | 3.8738176 | 26.452003 |

***Analysis: GROUP 1EX - 0.25 GM, Standards***

| **ELEMENT** | **Na** | **Nb** | **Ni** | **P** | **Pb** | **Rb** | **S** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** |
| **SI** | **9.652** | **0.2** | **<.1** | **0.008** | **11.4** | **2.8** | **0.2** |
| **LDL** | **0.001** | **0.1** | **0.1** | **0.001** | **0.1** | **0.1** | **0.1** |
| | | | | | | | |
| **230B PULP** | 5.053 | 11.2 | 4.2 | 0.05 | 9.2 | 36.2 | < .1 |
| **% Recovery** | 95.339623 | 86.153846 | 46.666667 | 93.984962 | 92 | 65.818182 | N/A |
| **253B PULP** | 5.048 | 11.6 | 3.6 | 0.05 | 9.2 | 37.8 | < .1 |
| **% Recovery** | 95.245283 | 89.230769 | 40 | 93.984962 | 92 | 68.727273 | N/A |
| **339B PULP** | 4.727 | 11 | 3.6 | 0.048 | 8.2 | 31.8 | < .1 |
| **% Recovery** | 89.188679 | 84.615385 | 40 | 90.225564 | 82 | 57.818182 | N/A |
| **4549B PULP** | 5.286 | 12.3 | 3.7 | 0.047 | 8.5 | 25.2 | < .1 |
| **% Recovery** | 99.735849 | 94.615385 | 41.111111 | 88.345865 | 85 | 45.818182 | N/A |
| **4587B PULP** | 4.622 | 11.1 | 4.6 | 0.044 | 7.9 | 30.5 | 0.1 |
| **% Recovery** | 87.207547 | 85.384615 | 51.111111 | 82.706767 | 79 | 55.454545 | 666.66667 |
| **6094B PULP** | 5.382 | 12 | 4 | 0.048 | 8.6 | 26.8 | 0.1 |
| **% Recovery** | 101.54717 | 92.307692 | 44.444444 | 90.225564 | 86 | 48.727273 | 666.66667 |
| **6145B PULP** | 4.905 | 11.1 | 3.8 | 0.051 | 8.7 | 29.2 | < .1 |
| **% Recovery** | 92.54717 | 85.384615 | 42.222222 | 95.864662 | 87 | 53.090909 | N/A |
| **4549B PULP** | 5.212 | 12.5 | 5.5 | 0.06 | 9.2 | 46.4 | < .1 |
| **% Recovery** | 98.339623 | 96.153846 | 61.111111 | 112.78195 | 92 | 84.363636 | N/A |
| | | | | | | | |
| **SY-4 Value** | 5.3 | 13 | 9 | 0.0532 | 10 | 55 | 0.015 |
| | | | | | | | |
| **Average % Recovery** | 94.893868 | 89.230769 | 45.833333 | 93.515038 | 86.875 | 59.977273 | N/A |
| | | | | | | | |
| **RSD** | 5.2997011 | 5.1311987 | 15.804127 | 9.4126538 | 5.6537792 | 20.947706 | N/A |
| | | | | | | | Over 25% values <LDL |

***Analysis: GROUP 1EX - 0.25 GM, Standards***

| **ELEMENT** | **Sb** | **Sc** | **Sn** | **Sr** | **Ta** | **Th** | **Ti** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **SI** | **0.9** | **< 1** | **2.4** | **167** | **< .1** | **0.3** | **0.032** |
| **LDL** | **0.1** | **1** | **0.1** | **1** | **0.1** | **0.1** | **0.01** |
| **230B PULP** | < .1 | 1 | 7.1 | 1053 | 0.7 | 1.1 | 0.184 |
| **% Recovery** | N/A | 90.909091 | 100 | 88.413098 | 77.777778 | 78.571429 | 113.23077 |
| **253B PULP** | < .1 | < 1 | 6.9 | 1031 | 0.6 | 1 | 0.18 |
| **% Recovery** | N/A | N/A | 97.183099 | 86.565911 | 66.666667 | 71.428571 | 110.76923 |
| **339B PULP** | 0.1 | < 1 | 6.7 | 1003 | 0.6 | 0.9 | 0.178 |
| **% Recovery** | 64.516129 | N/A | 94.366197 | 84.214945 | 66.666667 | 64.285714 | 109.53846 |
| **4549B PULP** | < .1 | < 1 | 8.4 | 966 | 0.8 | 0.8 | 0.17 |
| **% Recovery** | N/A | N/A | 118.30986 | 81.108312 | 88.888889 | 57.142857 | 104.61538 |
| **4587B PULP** | < .1 | 1 | 6.3 | 913 | 0.8 | 0.7 | 0.167 |
| **% Recovery** | N/A | 90.909091 | 88.732394 | 76.65827 | 88.888889 | 50 | 102.76923 |
| **6094B PULP** | 0.1 | < 1 | 7.6 | 955 | 0.8 | 0.7 | 0.188 |
| **% Recovery** | 64.516129 | N/A | 107.04225 | 80.184719 | 88.888889 | 50 | 115.69231 |
| **6145B PULP** | < .1 | 1 | 7.2 | 1022 | 0.6 | 0.7 | 0.173 |
| **% Recovery** | N/A | 90.909091 | 101.40845 | 85.810243 | 66.666667 | 50 | 106.46154 |
| **4549B PULP** | < .1 | 1 | 8.3 | 1202 | 0.8 | 1.3 | 0.201 |
| **% Recovery** | N/A | 90.909091 | 116.90141 | 100.92359 | 88.888889 | 92.857143 | 123.69231 |
| **SY-4 Value** | 0.155 | 1.1 | 7.1 | 1191 | 0.9 | 1.4 | 0.1625 |
| **Average % Recovery** | N/A | N/A | 102.99296 | 85.484887 | 79.166667 | 64.285714 | 110.84615 |
| **RSD** | N/A | N/A | 10.166476 | 8.5617054 | 13.90921 | 24.487696 | 6.0919815 |
|  | Over 25% values <LDL | Over 25% values <LDL |  |  |  |  |  |

***Analysis: GROUP 1EX - 0.25 GM, Standards***

| **ELEMENT** | **U** | **V** | **W** | **Y** | **Zn** | **Zr** |
|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **0.3** | **< 1** | **0.2** | **2.8** | **15** | **26.3** |
| **LDL** | **0.1** | **1** | **0.1** | **0.1** | **1** | **0.1** |
| **230B PULP** | 0.7 | 7 | < .1 | 87 | 95 | 38.2 |
| **% Recovery** | 87.5 | 87.5 | N/A | 73.109244 | 102.15054 | 7.3887814 |
| **253B PULP** | 0.4 | 6 | < .1 | 90.9 | 89 | 42.1 |
| **% Recovery** | 50 | 75 | N/A | 76.386555 | 95.698925 | 8.1431335 |
| **339B PULP** | 0.3 | 9 | 0.1 | 82.9 | 90 | 39.8 |
| **% Recovery** | 37.5 | 112.5 | 1.3157895 | 69.663866 | 96.774194 | 7.6982592 |
| **4549B PULP** | 0.4 | 7 | < .1 | 78 | 92 | 45.2 |
| **% Recovery** | 50 | 87.5 | N/A | 65.546218 | 98.924731 | 8.7427466 |
| **4587B PULP** | 0.3 | 11 | 0.1 | 68.7 | 90 | 44.3 |
| **% Recovery** | 37.5 | 137.5 | 1.3157895 | 57.731092 | 96.774194 | 8.5686654 |
| **6094B PULP** | 0.2 | 13 | < .1 | 75.6 | 95 | 49.9 |
| **% Recovery** | 25 | 162.5 | N/A | 63.529412 | 102.15054 | 9.6518375 |
| **6145B PULP** | 0.3 | 7 | < .1 | 79.4 | 94 | 46.8 |
| **% Recovery** | 37.5 | 87.5 | N/A | 66.722689 | 101.07527 | 9.0522244 |
| **4549B PULP** | 0.7 | 9 | 0.1 | 119.6 | 96 | 52.9 |
| **% Recovery** | 87.5 | 112.5 | 1.3157895 | 100.5042 | 103.22581 | 10.232108 |
| **SY-4 Value** | 0.8 | 8 | 7.6 | 119 | 93 | 517 |
| **Average % Recovery** | 51.5625 | 107.8125 | N/A | 71.64916 | 99.596774 | 8.6847195 |
| **RSD** | 45.699197 | 27.672107 | N/A | 18.13851 | 2.9390151 | 11.033574 |
|  |  |  | Over 25% values <LDL |  |  |  |

***Analysis: GROUP 4B - REE - 0.200 GM, ACME File #A305987, Standards***

| **ELEMENT** | **Ce** | **Co** | **Cs** | **Dy** | **Er** | **Eu** | **Ga** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **3.4** | **< .5** | **< .1** | **0.33** | **0.24** | **0.24** | **1.5** |
| **LDL** | **0.5** | **0.5** | **0.1** | **0.05** | **0.05** | **0.05** | **0.5** |
| | | | | | | | |
| **230B PULP** | 127.9 | 2.4 | 1.4 | 18.95 | 14.6 | 2.01 | 37.2 |
| **% Recovery** | 104.83607 | 85.714286 | 93.333333 | 104.12088 | 102.8169 | 100.5 | 106.28571 |
| **253B PULP** | 125.4 | 2.1 | 1.4 | 18.95 | 14.61 | 2.06 | 35.4 |
| **% Recovery** | 102.78689 | 75 | 93.333333 | 104.12088 | 102.88732 | 103 | 101.14286 |
| **339B PULP** | 132.8 | 2.6 | 1.6 | 18.97 | 15.14 | 2.12 | 35.9 |
| **% Recovery** | 108.85246 | 92.857143 | 106.66667 | 104.23077 | 106.61972 | 106 | 102.57143 |
| **4549B PULP** | 129.6 | 2.1 | 1.7 | 19.34 | 14.43 | 1.82 | 37 |
| **% Recovery** | 106.22951 | 75 | 113.33333 | 106.26374 | 101.61972 | 91 | 105.71429 |
| **4587B PULP** | 129 | 2.4 | 1.8 | 19.87 | 14.53 | 1.92 | 37.7 |
| **% Recovery** | 105.7377 | 85.714286 | 120 | 109.17582 | 102.32394 | 96 | 107.71429 |
| **6094B PULP** | 121.9 | 2.2 | 1.4 | 19.02 | 14.31 | 1.82 | 35.1 |
| **% Recovery** | 99.918033 | 78.571429 | 93.333333 | 104.50549 | 100.77465 | 91 | 100.28571 |
| **6145B PULP** | 128.8 | 2.1 | 1.5 | 18.75 | 13.48 | 1.75 | 34.1 |
| **% Recovery** | 105.57377 | 75 | 100 | 103.02198 | 94.929577 | 87.5 | 97.428571 |
| **4549B PULP** | 135.8 | 2.5 | 1.6 | 19.64 | 14.74 | 2.01 | 36.6 |
| **% Recovery** | 111.31148 | 89.285714 | 106.66667 | 107.91209 | 103.80282 | 100.5 | 104.57143 |
| | | | | | | | |
| **SY-4 Value** | 122 | 2.8 | 1.5 | 18.2 | 14.2 | 2 | 35 |
| | | | | | | | |
| **Average % Recovery** | 105.65574 | 82.142857 | 103.33333 | 105.41896 | 101.97183 | 96.9375 | 103.21429 |
| | | | | | | | |
| **RSD** | 3.28593 | 8.6956522 | 9.7539219 | 2.0409819 | 3.2689692 | 6.8062634 | 3.3668066 |

***Analysis: GROUP 4B - REE - 0.200 GM, ACME File #A305987, Standards***

| **ELEMENT** | **Gd** | **Hf** | **Ho** | **La** | **Lu** | **Nb** | **Nd** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **0.55** | **2.4** | **0.09** | **1.8** | **0.04** | **< .5** | **2** |
| **LDL** | **0.05** | **0.5** | **0.05** | **0.5** | **0.01** | **0.5** | **0.4** |
| | | | | | | | |
| **230B PULP** | 15.2 | 10.6 | 4.46 | 57.5 | 2.01 | 13.7 | 61.3 |
| **% Recovery** | 108.57143 | 100 | 103.72093 | 99.137931 | 95.714286 | 105.38462 | 107.54386 |
| **253B PULP** | 15.03 | 10.5 | 4.6 | 54.8 | 1.96 | 13.1 | 61.8 |
| **% Recovery** | 107.35714 | 99.056604 | 106.97674 | 94.482759 | 93.333333 | 100.76923 | 108.42105 |
| **339B PULP** | 15.12 | 12.7 | 4.71 | 59 | 2.1 | 14 | 66 |
| **% Recovery** | 108 | 119.81132 | 109.53488 | 101.72414 | 100 | 107.69231 | 115.78947 |
| **4549B PULP** | 14.03 | 11.1 | 4.54 | 55.5 | 2.14 | 13.3 | 58.4 |
| **% Recovery** | 100.21429 | 104.71698 | 105.5814 | 95.689655 | 101.90476 | 102.30769 | 102.45614 |
| **4587B PULP** | 14.13 | 11 | 4.55 | 56.4 | 2.11 | 13.7 | 60.5 |
| **% Recovery** | 100.92857 | 103.77358 | 105.81395 | 97.241379 | 100.47619 | 105.38462 | 106.14035 |
| **6094B PULP** | 14 | 11 | 4.45 | 54.7 | 2.12 | 13.6 | 58.2 |
| **% Recovery** | 100 | 103.77358 | 103.48837 | 94.310345 | 100.95238 | 104.61538 | 102.10526 |
| **6145B PULP** | 13.89 | 11.2 | 3.96 | 53.6 | 1.98 | 13.6 | 56.4 |
| **% Recovery** | 99.214286 | 105.66038 | 92.093023 | 92.413793 | 94.285714 | 104.61538 | 98.947368 |
| **4549B PULP** | 14.97 | 10.6 | 4.64 | 59 | 2.03 | 13.2 | 58.7 |
| **% Recovery** | 106.92857 | 100 | 107.90698 | 101.72414 | 96.666667 | 101.53846 | 102.98246 |
| | | | | | | | |
| **SY-4 Value** | 14 | 10.6 | 4.3 | 58 | 2.1 | 13 | 57 |
| | | | | | | | |
| **Average % Recovery** | 103.90179 | 104.59906 | 104.38953 | 97.090517 | 97.916667 | 104.03846 | 105.54825 |
| | | | | | | | |
| **RSD** | 3.9738721 | 6.3306485 | 5.1390331 | 3.6000345 | 3.3787269 | 2.2268992 | 4.9235187 |

***Analysis: GROUP 4B - REE - 0.200 GM, ACME File #A305987, Standards***

| **ELEMENT** | **Pr** | **Sn** | **Rb** | **Sm** | **Sr** | **Ta** | **Tb** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **0.44** | **4** | **2.8** | **0.4** | **167.8** | **< .1** | **0.09** |
| **LDL** | **0.02** | **1** | **0.5** | **0.1** | **0.5** | **0.1** | **0.01** |
| **230B PULP** | 14.79 | 7 | 54 | 12.9 | 1195 | 0.8 | 2.9 |
| **% Recovery** | 98.6 | 98.591549 | 98.181818 | 101.5748 | 100.33585 | 88.888889 | 111.53846 |
| **253B PULP** | 15.45 | 8 | 54.1 | 13.5 | 1205.3 | 0.8 | 3.01 |
| **% Recovery** | 103 | 112.67606 | 98.363636 | 106.29921 | 101.20067 | 88.888889 | 115.76923 |
| **339B PULP** | 16.09 | 8 | 55.4 | 13.5 | 1265.1 | 0.7 | 3.13 |
| **% Recovery** | 107.26667 | 112.67606 | 100.72727 | 106.29921 | 106.22166 | 77.777778 | 120.38462 |
| **4549B PULP** | 15.17 | 7 | 54.1 | 13 | 1203 | 0.8 | 2.86 |
| **% Recovery** | 101.13333 | 98.591549 | 98.363636 | 102.3622 | 101.00756 | 88.888889 | 110 |
| **4587B PULP** | 15.45 | 10 | 56.2 | 13.9 | 1255 | 0.8 | 2.76 |
| **% Recovery** | 103 | 140.84507 | 102.18182 | 109.44882 | 105.37364 | 88.888889 | 106.15385 |
| **6094B PULP** | 14.95 | 6 | 53.9 | 13.8 | 1237.9 | 0.8 | 2.68 |
| **% Recovery** | 99.666667 | 84.507042 | 98 | 108.66142 | 103.93787 | 88.888889 | 103.07692 |
| **6145B PULP** | 14.7 | 5 | 51.7 | 12.7 | 1196.2 | 0.8 | 2.74 |
| **% Recovery** | 98 | 70.422535 | 94 | 100 | 100.43661 | 88.888889 | 105.38462 |
| **4549B PULP** | 15.58 | 6 | 55.8 | 13.4 | 1257.7 | 0.8 | 2.9 |
| **% Recovery** | 103.86667 | 84.507042 | 101.45455 | 105.51181 | 105.60034 | 88.888889 | 111.53846 |
| **SY-4 Value** | 15 | 7.1 | 55 | 12.7 | 1191 | 0.9 | 2.6 |
| **Average % Recovery** | 101.81667 | 100.35211 | 98.909091 | 105.01969 | 103.01427 | 87.5 | 110.48077 |
| **RSD** | 3.0319634 | 21.791544 | 2.6070743 | 3.22953 | 2.4483599 | 4.4895669 | 5.1660988 |

***Analysis: GROUP 4B - REE - 0.200 GM, ACME File #A305987, Standards***

| **ELEMENT** | **Th** | **Tm** | **U** | **V** | **W** | **Y** | **Yb** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **0.4** | **< .05** | **0.3** | **< 5** | **0.1** | **2.9** | **0.27** |
| **LDL** | **0.1** | **0.05** | **0.1** | **5** | **0.1** | **0.1** | **0.05** |
| | | | | | | | |
| **230B PULP** | 1.4 | 2.29 | 0.7 | 5 | 0.2 | 126.6 | 15.1 |
| **% Recovery** | 100 | 99.565217 | 87.5 | 62.5 | 2.6315789 | 106.38655 | 102.02703 |
| **253B PULP** | 2 | 2.44 | 1 | < 5 | 4.5 | 120.6 | 15.44 |
| **% Recovery** | 142.85714 | 106.08696 | 125 | N/A | 59.210526 | 101.34454 | 104.32432 |
| **339B PULP** | 2.4 | 2.63 | 1.3 | 5 | 0.2 | 129.9 | 15.43 |
| **% Recovery** | 171.42857 | 114.34783 | 162.5 | 62.5 | 2.6315789 | 109.15966 | 104.25676 |
| **4549B PULP** | 2.2 | 2.37 | 1.1 | < 5 | *0.05* | 129.8 | 15 |
| **% Recovery** | 157.14286 | 103.04348 | 137.5 | N/A | 0.6578947 | 109.07563 | 101.35135 |
| **4587B PULP** | 1 | 2.44 | 0.8 | 5 | 0.1 | 132.6 | 15.98 |
| **% Recovery** | 71.428571 | 106.08696 | 100 | 62.5 | 1.3157895 | 111.42857 | 107.97297 |
| **6094B PULP** | 1.3 | 2.4 | 0.8 | < 5 | 0.1 | 124 | 14.81 |
| **% Recovery** | 92.857143 | 104.34783 | 100 | N/A | 1.3157895 | 104.20168 | 100.06757 |
| **6145B PULP** | 1 | 2.08 | 0.9 | < 5 | 0.1 | 124 | 14.26 |
| **% Recovery** | 71.428571 | 90.434783 | 112.5 | N/A | 1.3157895 | 104.20168 | 96.351351 |
| **4549B PULP** | 1.7 | 2.46 | 0.9 | 6 | *0.05* | 133.9 | 15.07 |
| **% Recovery** | 121.42857 | 106.95652 | 112.5 | 75 | 0.6578947 | 112.52101 | 101.82432 |
| | | | | | | | |
| **SY-4 Value** | 1.4 | 2.3 | 0.8 | 8 | 7.6 | 119 | 14.8 |
| | | | | | | | |
| **Average % Recovery** | 116.07143 | 103.8587 | 117.1875 | N/A | 8.7171053 | 107.28992 | 102.27196 |
| | | | | | | | |
| **RSD** | 33.016812 | 6.601826 | 20.507838 | N/A | 234.21428 | 3.6340804 | 3.3399221 |
| | | | | Over 25% values <LDL | 2 values <LDL | | |

***Analysis: GROUP 4B - REE - 0.200 GM, ACME File #A305987, Standards***

| | |
|---|---|
| **ELEMENT** | **Zr** |
| **SAMPLES** | **ppm** |
| **SI** | **85.7** |
| **LDL** | **0.5** |
| | |
| **230B PULP** | 493.4 |
| **% Recovery** | 95.435203 |
| **253B PULP** | 503.5 |
| **% Recovery** | 97.388781 |
| **339B PULP** | 565.4 |
| **% Recovery** | 109.3617 |
| **4549B PULP** | 505.8 |
| **% Recovery** | 97.833656 |
| **4587B PULP** | 527.8 |
| **% Recovery** | 102.08897 |
| **6094B PULP** | 551.3 |
| **% Recovery** | 106.63443 |
| **6145B PULP** | 525 |
| **% Recovery** | 101.54739 |
| **4549B PULP** | 515.5 |
| **% Recovery** | 99.709865 |
| | |
| **SY-4 Value** | 517 |
| | |
| **Average % Recovery** | 101.25 |
| | |
| **RSD** | 4.6974568 |

***Analysis: GROUP 4A - 0.200 GM, Standards***

| **ELEMENT** | **Al2O3** | **Ba** | **CaO** | **Cr2O3** | **Cr2O3** | **Fe2O3** | **K2O** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **%** | **ppm** | **%** | **%** | **%** | **%** | **%** |
| **SI** | | | | | | | |
| **LDL** | **0.03** | **5** | **0.01** | **0.001** | **0.001** | **0.04** | **0.04** |
| | | | | | | | |
| **230B PULP** | 20.54 | 348 | 8.35 | < .001 | 0.001 | 6.32 | 1.66 |
| **% Recovery** | 99.275012 | 102.35294 | 103.72671 | N/A | N/A | 101.77134 | 100 |
| **253B PULP** | 20.36 | 335 | 8.31 | < .001 | 0.0009 | 6.28 | 1.67 |
| **% Recovery** | 98.405027 | 98.529412 | 103.22981 | N/A | N/A | 101.12721 | 100.60241 |
| **339B PULP** | 20.34 | 339 | 8.33 | 0.002 | 0.0012 | 6.3 | 1.66 |
| **% Recovery** | 98.308362 | 99.705882 | 103.47826 | N/A | N/A | 101.44928 | 100 |
| **4549B PULP** | 20.9 | 341 | 8.15 | < .001 | 0.0009 | 6.02 | 1.63 |
| **% Recovery** | 101.01498 | 100.29412 | 101.24224 | N/A | N/A | 96.940419 | 98.192771 |
| **4587B PULP** | 20.96 | 335 | 8.23 | < .001 | 0.001 | 6.08 | 1.65 |
| **% Recovery** | 101.30498 | 98.529412 | 102.23602 | N/A | N/A | 97.906602 | 99.39759 |
| **6094B PULP** | 21.02 | 330 | 8.24 | < .001 | 0.001 | 6.09 | 1.65 |
| **% Recovery** | 101.59497 | 97.058824 | 102.36025 | N/A | N/A | 98.067633 | 99.39759 |
| **6145B PULP** | 20.64 | 347 | 8.19 | < .001 | 0.0009 | 6.29 | 1.62 |
| **% Recovery** | 99.758337 | 102.05882 | 101.73913 | N/A | N/A | 101.28824 | 97.590361 |
| **4549B PULP** | 20.82 | 335.7 | 8.31 | < .001 | 0.0011 | 6.39 | 1.7 |
| **% Recovery** | 100.62832 | 98.735294 | 103.22981 | N/A | N/A | 102.89855 | 102.40964 |
| | | | | | | | |
| **SY-4 Value** | 20.69 | 340 | 8.05 | N/A | N/A | 6.21 | 1.66 |
| | | | | | | | |
| **Average % Recovery** | 100.03625 | 99.658088 | 102.65528 | N/A | N/A | 100.18116 | 99.698795 |
| | | | | | | | |
| **RSD** | 1.289658 | 1.8419811 | 0.8700678 | N/A | N/A | 2.1929297 | 1.4800542 |
| | | | | Over 25% values <LDL | Over 25% values <LDL | | |

***Analysis: GROUP 4A - 0.200 GM, Standards***

| **ELEMENT** | **LOI** | **MgO** | **MnO** | **Na2O** | **Ni** | **P2O5** | **Sc** |
|---|---|---|---|---|---|---|---|
| **SAMPLES** | **%** | **%** | **%** | **%** | **ppm** | **%** | **ppm** |
| **SI** | | | | | | | |
| **LDL** | **0.1** | **0.01** | **0.01** | **0.01** | **30** | **0.01** | **1** |
| **230B PULP** | 3.8 | 0.53 | 0.1 | 7.6 | < 20 | 0.12 | *0.5* |
| **% Recovery** | 83.333333 | 98.148148 | 92.592593 | 107.04225 | N/A | 91.603053 | 45.454545 |
| **253B PULP** | 4.2 | 0.53 | 0.1 | 7.6 | < 20 | 0.11 | 1 |
| **% Recovery** | 92.105263 | 98.148148 | 92.592593 | 107.04225 | N/A | 83.969466 | 90.909091 |
| **339B PULP** | 4.4 | 0.53 | 0.1 | 7.69 | < 20 | 0.13 | 1 |
| **% Recovery** | 96.491228 | 98.148148 | 92.592593 | 108.30986 | N/A | 99.236641 | 90.909091 |
| **4549B PULP** | 4.1 | 0.54 | 0.1 | 6.83 | < 20 | 0.13 | 1 |
| **% Recovery** | 89.912281 | 100 | 92.592593 | 96.197183 | N/A | 99.236641 | 90.909091 |
| **4587B PULP** | 4 | 0.54 | 0.1 | 7.04 | < 20 | 0.12 | *0.5* |
| **% Recovery** | 87.719298 | 100 | 92.592593 | 99.15493 | N/A | 91.603053 | 45.454545 |
| **6094B PULP** | 4 | 0.55 | 0.1 | 7.2 | < 20 | 0.13 | 1 |
| **% Recovery** | 87.719298 | 101.85185 | 92.592593 | 101.40845 | N/A | 99.236641 | 90.909091 |
| **6145B PULP** | 4.5 | 0.54 | 0.1 | 7.16 | 24 | 0.11 | 1 |
| **% Recovery** | 98.684211 | 100 | 92.592593 | 100.84507 | 266.66667 | 83.969466 | 90.909091 |
| **4549B PULP** | 4.4 | 0.54 | 0.1 | 7.02 | < 20 | 0.12 | 1 |
| **% Recovery** | 96.491228 | 100 | 92.592593 | 98.873239 | N/A | 91.603053 | 90.909091 |
| **SY-4 Value** | 4.56 | 0.54 | 0.108 | 7.1 | 9 | 0.131 | 1.1 |
| **Average % Recovery** | 91.557018 | 99.537037 | 92.592593 | 102.35915 | N/A | 92.557252 | 79.545455 |
| **RSD** | 5.8320139 | 1.3155475 | 0 | 4.413442 | N/A | 6.8826636 | 26.452003 |
| | | | | | Over 25% values <LDL | | 2 values <LDL |

***Analysis: GROUP 4A - 0.200 GM, Standards***

| **ELEMENT** | SiO2 | TiO2 |
|---|---|---|
| **SAMPLES** | % | % |
| **SI** | | |
| **LDL** | **0.02** | **0.01** |
| | | |
| **230B PULP** | 50.32 | 0.29 |
| **% Recovery** | 100.84168 | 101.0453 |
| **253B PULP** | 50.11 | 0.29 |
| **% Recovery** | 100.42084 | 101.0453 |
| **339B PULP** | 49.83 | 0.29 |
| **% Recovery** | 99.859719 | 101.0453 |
| **4549B PULP** | 50.85 | 0.29 |
| **% Recovery** | 101.90381 | 101.0453 |
| **4587B PULP** | 50.54 | 0.29 |
| **% Recovery** | 101.28257 | 101.0453 |
| **6094B PULP** | 50.29 | 0.29 |
| **% Recovery** | 100.78156 | 101.0453 |
| **6145B PULP** | 50.27 | 0.29 |
| **% Recovery** | 100.74148 | 101.0453 |
| **4549B PULP** | 49.78 | 0.29 |
| **% Recovery** | 99.759519 | 101.0453 |
| | | |
| **SY-4 Value** | 49.9 | 0.287 |
| | | |
| **Average % Recovery** | 100.6989 | 101.0453 |
| | | |
| **RSD** | 0.7007408 | 0 |

***Analysis: CO2, ACME File #A305987, Standards***

| **ELEMENT**<br>**SAMPLES** | **TOT/C**<br>**%** | **TOT/S**<br>**%** | **SUM**<br>**%** | **C/ORG**<br>**%** | **C/GRA**<br>**%** | **CO2**<br>**%** | **SO4**<br>**%** |
|---|---|---|---|---|---|---|---|
| **SI** | | | | **2.34** | **< .02** | **0.06** | **0.26** |
| **LDL** | **0.01** | **0.01** | | | | | |
| **230B PULP** | 1.11 | 0.02 | 99.67 | 0.12 | 0.1 | 3.29 | 0.06 |
| **% Recovery** | 111 | 133.33333 | N/A | N/A | N/A | 94 | N/A |
| **253B PULP** | 1.08 | 0.02 | 99.6 | 0.09 | 0.09 | 3.29 | 0.12 |
| **% Recovery** | 108 | 133.33333 | N/A | N/A | N/A | 94 | N/A |
| **339B PULP** | 1.1 | < .01 | 99.63 | 0.11 | 0.09 | 3.31 | 0.09 |
| **% Recovery** | 110 | N/A | N/A | N/A | N/A | 94.571429 | N/A |
| **4549B PULP** | 1.09 | < .01 | 99.58 | 0.09 | 0.12 | 3.23 | 0.08 |
| **% Recovery** | 109 | N/A | N/A | N/A | N/A | 92.285714 | N/A |
| **4587B PULP** | 1.08 | < .01 | 99.6 | 0.09 | 0.12 | 3.19 | 0.08 |
| **% Recovery** | 108 | N/A | N/A | N/A | N/A | 91.142857 | N/A |
| **6094B PULP** | 1.12 | < .01 | 99.6 | 0.12 | 0.1 | 3.14 | 0.08 |
| **% Recovery** | 112 | N/A | N/A | N/A | N/A | 89.714286 | N/A |
| **6145B PULP** | 1.09 | < .01 | 99.75 | 0.1 | 0.14 | 3.14 | 0.09 |
| **% Recovery** | 109 | N/A | N/A | N/A | N/A | 89.714286 | N/A |
| **4549B PULP** | 1.14 | 0.01 | 99.47 | 0.14 | 0.09 | 3.31 | 0.24 |
| **% Recovery** | 114 | 66.666667 | N/A | N/A | N/A | 94.571429 | N/A |
| **SY-4 Value** | 1 | 0.015 | N/A | N/A | N/A | 3.5 | N/A |
| **Average % Recovery** | 110.125 | N/A | N/A | N/A | N/A | 92.5 | N/A |
| **RSD** | 1.9070784 | N/A | N/A | N/A | N/A | 2.2562463 | N/A |
| | | Over 25% values <LDL | Over 25% values <LDL | Over 25% values <LDL | Over 25% values <LDL | | Over 25% values <LDL |

** If less than 25% of values are <LDL, the value was set to 1/2 the LDL. if more than 25% of values are <LDL, then the value was not calculated*

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Analysis Date** | **Ag** | **Al** | **As** | **Au** | **B** | **Ba** |
|---|---|---|---|---|---|---|---|
| | | **ppb** | **%** | **ppm** | **ppb** | **ppm** | **ppm** |
| **SI** | | **10** | **0.02** | **0.1** | **0.2** | **2** | **7.5** |
| **LDL** | | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** |
| **SAMPLES** | | | | | | | |
| **201** | Dec. 2003 | 543 | 0.73 | 41 | 1.4 | 16 | 64.7 |
| **6155 (RE 201)** | | 538 | 0.62 | 42.6 | 1.5 | 18 | 77 |
| **RPD** | | 0.9250694 | 16.296296 | 3.8277512 | 6.8965517 | 11.764706 | 17.360621 |
| **220** | Dec. 2003 | 329 | 1.15 | 14.2 | 1 | 18 | 88.4 |
| **RE 220** | | 315 | 1.17 | 14.5 | 1 | 15 | 85.3 |
| **RPD** | | 4.3478261 | 1.7241379 | 2.0905923 | 0 | 18.181818 | 3.5693725 |
| **239** | Dec. 2003 | 306 | 0.62 | 28.6 | 0.3 | 12 | 122.7 |
| **6156 (RE 239)** | | 336 | 0.62 | 31.3 | 1.7 | 12 | 135 |
| **RPD** | | 9.3457944 | 0 | 9.015025 | 140 | 0 | 9.5459837 |
| **276** | Dec. 2003 | 152 | 1.28 | 5.9 | 0.3 | 15 | 210.7 |
| **6157 (RE 276)** | | 157 | 0.97 | 4.5 | *0.1* | 12 | 222.1 |
| **RPD** | | 3.236246 | 27.555556 | 26.923077 | 100 | 22.222222 | 5.2680222 |
| **280** | Dec. 2003 | 236 | 0.78 | 31.3 | *0.1* | 10 | 40.2 |
| **RE 280** | | 226 | 0.76 | 30.6 | 0.3 | 7 | 38.5 |
| **RPD** | | 4.3290043 | 2.5974026 | 2.2617124 | 100 | 35.294118 | 4.3202033 |
| **308** | Dec. 2003 | 655 | 1.14 | 37.1 | 0.2 | 5 | 30 |
| **6158 (RE 308)** | | 685 | 1.12 | 39.5 | 1.2 | 10 | 36.9 |
| **RPD** | | 4.4776119 | 1.7699115 | 6.2663185 | 142.85714 | 66.666667 | 20.627803 |
| **310** | Dec. 2003 | 467 | 1.17 | 28.5 | 0.4 | 6 | 38.4 |
| **RE 310** | | 442 | 1.14 | 27.9 | 0.7 | 7 | 35.8 |
| **RPD** | | 5.5005501 | 2.5974026 | 2.1276596 | 54.545455 | 15.384615 | 7.0080863 |
| **341** | Dec. 2003 | 298 | 0.76 | 13.3 | 0.8 | 8 | 83 |
| **6159 (RE 341)** | | 325 | 0.8 | 15 | 0.7 | 10 | 149.8 |
| **RPD** | | 8.6677368 | 5.1282051 | 12.014134 | 13.333333 | 22.222222 | 57.388316 |
| **359** | Dec. 2003 | 277 | 0.74 | 23.1 | 0.4 | 7 | 40.7 |
| **RE 359** | | 279 | 0.77 | 23.5 | 0.3 | 7 | 46 |
| **RPD** | | 0.7194245 | 3.9735099 | 1.7167382 | 28.571429 | 0 | 12.226067 |
| **371** | Dec. 2003 | 281 | 0.79 | 28.1 | 0.6 | 7 | 50.7 |
| **6160 (RE 371)** | | 296 | 0.94 | 31.3 | 0.5 | 9 | 65.6 |
| **RPD** | | 5.1993068 | 17.34104 | 10.774411 | 18.181818 | 25 | 25.623388 |
| **396** | Dec. 2003 | 183 | 0.8 | 20.8 | 0.2 | 8 | 45 |
| **RE 396** | | 175 | 0.82 | 21.6 | 0.4 | 6 | 47.1 |
| **RPD** | | 4.4692737 | 2.4691358 | 3.7735849 | 66.666667 | 28.571429 | 4.5602606 |
| **399** | Dec. 2003 | 199 | 0.95 | 20.3 | *0.1* | 7 | 41 |
| **6161 (RE 399)** | | 183 | 0.92 | 21.8 | 0.5 | 8 | 42.6 |
| **RPD** | | 8.3769634 | 3.2085561 | 7.1258907 | 133.33333 | 13.333333 | 3.8277512 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Bi** | **Ca** | **Cd** | **Co** | **Cr** | **Cu** | **Fe** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **SI** | **0.03** | **0.39** | **0.01** | **0.1** | **0.7** | **1.15** | **0.05** |
| **LDL** | **0.02** | **0.01** | **0.01** | **0.1** | **0.5** | **0.01** | **0.01** |
| **SAMPLES** | | | | | | | |
| **201** | 0.25 | 7.5 | 4.26 | 24.1 | 19.5 | 53.65 | 3.27 |
| **6155 (RE 201)** | 0.28 | 8.25 | 4.5 | 26.5 | 18.7 | 56.01 | 3.28 |
| **RPD** | 11.320755 | 9.5238095 | 5.4794521 | 9.486166 | 4.1884817 | 4.304213 | 0.3053435 |
| **220** | 0.55 | 0.4 | 0.53 | 8.1 | 15.2 | 55.18 | 2.07 |
| **RE 220** | 0.51 | 0.39 | 0.55 | 8.2 | 15.6 | 56.77 | 2.07 |
| **RPD** | 7.5471698 | 2.5316456 | 3.7037037 | 1.2269939 | 2.5974026 | 2.8405538 | 0 |
| **239** | 0.21 | 9.14 | 1.83 | 14.9 | 12.6 | 40.73 | 2.56 |
| **6156 (RE 239)** | 0.24 | 9.53 | 2.06 | 17 | 13 | 43.16 | 2.71 |
| **RPD** | 13.333333 | 4.1778254 | 11.825193 | 13.166144 | 3.125 | 5.7933008 | 5.6925996 |
| **276** | 0.68 | 0.25 | 2.14 | 8.9 | 8.5 | 40.73 | 1.61 |
| **6157 (RE 276)** | 0.7 | 0.38 | 2.14 | 9.1 | 5.7 | 36.94 | 1.29 |
| **RPD** | 2.8985507 | 41.269841 | 0 | 2.2222222 | 39.43662 | 9.7592378 | 22.068966 |
| **280** | 0.26 | 3.91 | 0.92 | 16.6 | 15.6 | 40.22 | 4.7 |
| **RE 280** | 0.24 | 3.8 | 0.91 | 15.7 | 15.1 | 37.99 | 4.54 |
| **RPD** | 8 | 2.8534371 | 1.0928962 | 5.5727554 | 3.257329 | 5.7025956 | 3.4632035 |
| **308** | 0.44 | 0.38 | 2.3 | 22.7 | 18.5 | 70.94 | 3.86 |
| **6158 (RE 308)** | 0.46 | 0.28 | 4.01 | 21.6 | 17.6 | 73.84 | 3.7 |
| **RPD** | 4.4444444 | 30.30303 | 54.199683 | 4.96614 | 4.9861496 | 4.0060782 | 4.2328042 |
| **310** | 0.42 | 0.25 | 1.73 | 19.7 | 19.2 | 59.41 | 3.45 |
| **RE 310** | 0.41 | 0.25 | 1.79 | 19.1 | 18.3 | 58.13 | 3.41 |
| **RPD** | 2.4096386 | 0 | 3.4090909 | 3.0927835 | 4.8 | 2.177982 | 1.1661808 |
| **341** | 0.24 | 3.52 | 1.17 | 9.3 | 13.2 | 34.59 | 1.7 |
| **6159 (RE 341)** | 0.28 | 3.35 | 0.96 | 10.4 | 13 | 39.36 | 1.61 |
| **RPD** | 15.384615 | 4.9490539 | 19.71831 | 11.167513 | 1.5267176 | 12.900609 | 5.4380665 |
| **359** | 0.25 | 2.77 | 0.66 | 11.8 | 14 | 31.93 | 2.61 |
| **RE 359** | 0.26 | 2.82 | 0.69 | 12.2 | 13.9 | 33.28 | 2.66 |
| **RPD** | 3.9215686 | 1.7889088 | 4.4444444 | 3.3333333 | 0.7168459 | 4.1404693 | 1.8975332 |
| **371** | 0.26 | 2.06 | 1.05 | 11.5 | 13.5 | 32.4 | 2.69 |
| **6160 (RE 371)** | 0.31 | 2.08 | 1.03 | 13.2 | 15.1 | 38.69 | 2.6 |
| **RPD** | 17.54386 | 0.9661836 | 1.9230769 | 13.765182 | 11.188811 | 17.695878 | 3.4026465 |
| **396** | 0.27 | 1.91 | 0.67 | 11.8 | 13.2 | 25.87 | 2.78 |
| **RE 396** | 0.28 | 1.96 | 0.71 | 11.5 | 12.7 | 26.2 | 2.85 |
| **RPD** | 3.6363636 | 2.5839793 | 5.7971014 | 2.5751073 | 3.8610039 | 1.2675245 | 2.4866785 |
| **399** | 0.24 | 1.98 | 0.64 | 13 | 14.3 | 29.18 | 3.21 |
| **6161 (RE 399)** | 0.27 | 1.59 | 0.56 | 13.7 | 14 | 29.79 | 3.13 |
| **RPD** | 11.764706 | 21.848739 | 13.333333 | 5.2434457 | 2.1201413 | 2.0688486 | 2.5236593 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Ga** | **Hg** | **K** | **La** | **Mg** | **Mn** | **Mo** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **ppb** | **%** | **ppm** | **%** | **ppm** | **ppm** |
| **SI** | **0.1** | **14** | **0.01** | **< .5** | **0.01** | **10** | **0.05** |
| **LDL** | **0.1** | **5** | **0.01** | **0.5** | **0.01** | **1** | **0.01** |
| **SAMPLES** | | | | | | | |
| **201** | 3.6 | 249 | 0.22 | 7.6 | 0.36 | 97 | 53.59 |
| **6155 (RE 201)** | 3.5 | 206 | 0.2 | 9.2 | 0.36 | 99 | 54.47 |
| **RPD** | 2.8169014 | 18.901099 | 9.5238095 | 19.047619 | 0 | 2.0408163 | 1.6287248 |
| **220** | 3.6 | 127 | 0.26 | 16 | 0.34 | 86 | 6.04 |
| **RE 220** | 3.8 | 113 | 0.26 | 15.5 | 0.35 | 86 | 5.8 |
| **RPD** | 5.4054054 | 11.666667 | 0 | 3.1746032 | 2.8985507 | 0 | 4.0540541 |
| **239** | 2.9 | 163 | 0.2 | 7.8 | 0.42 | 314 | 23.49 |
| **6156 (RE 239)** | 3.1 | 205 | 0.2 | 8.4 | 0.43 | 320 | 24.26 |
| **RPD** | 6.6666667 | 22.826087 | 0 | 7.4074074 | 2.3529412 | 1.8927445 | 3.2251309 |
| **276** | 4.2 | 89 | 0.24 | 27.9 | 0.28 | 810 | 2.65 |
| **6157 (RE 276)** | 3.4 | 62 | 0.21 | 29.4 | 0.23 | 599 | 3.07 |
| **RPD** | 21.052632 | 35.761589 | 13.333333 | 5.2356021 | 19.607843 | 29.950319 | 14.685315 |
| **280** | 2.5 | 155 | 0.24 | 4 | 0.53 | 167 | 32.62 |
| **RE 280** | 2.5 | 142 | 0.23 | 3.9 | 0.51 | 168 | 31.32 |
| **RPD** | 0 | 8.7542088 | 4.2553191 | 2.5316456 | 3.8461538 | 0.5970149 | 4.0663122 |
| **308** | 3.2 | 270 | 0.27 | 4.7 | 0.32 | 130 | 23.6 |
| **6158 (RE 308)** | 3.5 | 420 | 0.28 | 5.9 | 0.29 | 121 | 23.6 |
| **RPD** | 8.9552239 | 43.478261 | 3.6363636 | 22.641509 | 9.8360656 | 7.1713147 | 0 |
| **310** | 3.5 | 375 | 0.27 | 3.9 | 0.34 | 142 | 16.99 |
| **RE 310** | 3.4 | 371 | 0.27 | 3.8 | 0.34 | 144 | 16.78 |
| **RPD** | 2.8985507 | 1.0723861 | 0 | 2.5974026 | 0 | 1.3986014 | 1.2437074 |
| **341** | 2.6 | 69 | 0.27 | 4.2 | 0.47 | 68 | 5.52 |
| **6159 (RE 341)** | 2.7 | 87 | 0.26 | 4.9 | 0.48 | 61 | 5.32 |
| **RPD** | 3.7735849 | 23.076923 | 3.7735849 | 15.384615 | 2.1052632 | 10.852713 | 3.6900369 |
| **359** | 2.3 | 75 | 0.22 | 3.3 | 0.48 | 83 | 4.61 |
| **RE 359** | 2.4 | 73 | 0.24 | 3.4 | 0.48 | 91 | 4.78 |
| **RPD** | 4.2553191 | 2.7027027 | 8.6956522 | 2.9850746 | 0 | 9.1954023 | 3.6208733 |
| **371** | 2.8 | 70 | 0.24 | 3.4 | 0.44 | 73 | 8.1 |
| **6160 (RE 371)** | 3.3 | 74 | 0.3 | 4.1 | 0.42 | 72 | 8.46 |
| **RPD** | 16.393443 | 5.5555556 | 22.222222 | 18.666667 | 4.6511628 | 1.3793103 | 4.3478261 |
| **396** | 2.2 | 72 | 0.22 | 3.2 | 0.58 | 99 | 3.95 |
| **RE 396** | 2.2 | 59 | 0.22 | 3.3 | 0.6 | 102 | 3.9 |
| **RPD** | 0 | 19.847328 | 0 | 3.0769231 | 3.3898305 | 2.9850746 | 1.2738854 |
| **399** | 2.6 | 95 | 0.27 | 3.3 | 0.67 | 111 | 4.97 |
| **6161 (RE 399)** | 2.6 | 85 | 0.26 | 3.1 | 0.67 | 93 | 4.06 |
| **RPD** | 0 | 11.111111 | 3.7735849 | 6.25 | 0 | 17.647059 | 20.155039 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Na** | **Ni** | **P** | **Pb** | **S** | **Sb** | **Sc** |
|---|---|---|---|---|---|---|---|
| | **%** | **ppm** | **%** | **ppm** | **%** | **ppm** | **ppm** |
| **SI** | **1.421** | **0.1** | **< .001** | **1.63** | **0.02** | **0.18** | **0.3** |
| **LDL** | **0.001** | **0.1** | **0.001** | **0.01** | **0.02** | **0.02** | **0.1** |
| **SAMPLES** | | | | | | | |
| **201** | 0.28 | 132.6 | 0.06 | 11.66 | 3.47 | 3.21 | 3.6 |
| **6155 (RE 201)** | 0.269 | 139.9 | 0.074 | 12.67 | 3.9 | 3.67 | 3.8 |
| **RPD** | 4.007286 | 5.3577982 | 20.895522 | 8.3025072 | 11.668928 | 13.372093 | 5.4054054 |
| **220** | 0.6 | 35 | 0.072 | 19.63 | 1.99 | 0.24 | 3.4 |
| **RE 220** | 0.612 | 35.4 | 0.075 | 18.2 | 2.03 | 0.22 | 3.5 |
| **RPD** | 1.980198 | 1.1363636 | 4.0816327 | 7.5601375 | 1.9900498 | 8.6956522 | 2.8985507 |
| **239** | 0.346 | 55 | 0.057 | 11.47 | 2.95 | 1.92 | 2.9 |
| **6156 (RE 239)** | 0.338 | 60.9 | 0.061 | 13.37 | 3.1 | 2.04 | 2.9 |
| **RPD** | 2.3391813 | 10.181191 | 6.779661 | 15.297907 | 4.9586777 | 6.0606061 | 0 |
| **276** | 1.156 | 44.1 | 0.029 | 23.04 | 0.21 | 0.38 | 3.1 |
| **6157 (RE 276)** | 1.184 | 48.1 | 0.027 | 21.91 | 0.15 | 0.41 | 2.6 |
| **RPD** | 2.3931624 | 8.6767896 | 7.1428571 | 5.0278087 | 33.333333 | 7.5949367 | 17.54386 |
| **280** | 0.184 | 51.5 | 0.062 | 13.73 | 2.84 | 0.74 | 5.9 |
| **RE 280** | 0.178 | 49.6 | 0.06 | 13 | 2.78 | 0.69 | 5.9 |
| **RPD** | 3.3149171 | 3.7586548 | 3.2786885 | 5.4620277 | 2.1352313 | 6.993007 | 0 |
| **308** | 0.204 | 82.9 | 0.061 | 22.1 | 2.92 | 1.73 | 3.9 |
| **6158 (RE 308)** | 0.24 | 83.5 | 0.079 | 22.9 | 3.85 | 1.66 | 4.2 |
| **RPD** | 16.216216 | 0.7211538 | 25.714286 | 3.5555556 | 27.474151 | 4.1297935 | 7.4074074 |
| **310** | 0.231 | 65.2 | 0.062 | 22.4 | 2.35 | 1.4 | 3.9 |
| **RE 310** | 0.235 | 63.1 | 0.061 | 22.29 | 2.36 | 1.35 | 4.1 |
| **RPD** | 1.7167382 | 3.2735776 | 1.6260163 | 0.4922802 | 0.4246285 | 3.6363636 | 5 |
| **341** | 0.219 | 40.5 | 0.056 | 12.59 | 1.32 | 0.82 | 3.6 |
| **6159 (RE 341)** | 0.231 | 45.1 | 0.065 | 14.55 | 1.42 | 0.94 | 4 |
| **RPD** | 5.3333333 | 10.747664 | 14.876033 | 14.443626 | 7.2992701 | 13.636364 | 10.526316 |
| **359** | 0.213 | 35 | 0.062 | 14.76 | 1.98 | 0.68 | 4.6 |
| **RE 359** | 0.215 | 37.3 | 0.064 | 15.58 | 2.07 | 0.64 | 4.7 |
| **RPD** | 0.9345794 | 6.362379 | 3.1746032 | 5.4054054 | 4.4444444 | 6.0606061 | 2.1505376 |
| **371** | 0.222 | 45.9 | 0.062 | 15.12 | 1.99 | 0.89 | 4.5 |
| **6160 (RE 371)** | 0.223 | 52.5 | 0.071 | 17.67 | 2.45 | 0.9 | 5.3 |
| **RPD** | 0.4494382 | 13.414634 | 13.533835 | 15.553522 | 20.720721 | 1.1173184 | 16.326531 |
| **396** | 0.211 | 36.2 | 0.063 | 15.13 | 2.2 | 0.86 | 4.2 |
| **RE 396** | 0.211 | 35.1 | 0.063 | 15.12 | 2.22 | 0.8 | 4.2 |
| **RPD** | 0 | 3.085554 | 0 | 0.0661157 | 0.9049774 | 7.2289157 | 0 |
| **399** | 0.192 | 40.6 | 0.068 | 15.37 | 2.54 | 0.65 | 4.8 |
| **6161 (RE 399)** | 0.213 | 43.8 | 0.064 | 16.73 | 2.74 | 0.77 | 4.8 |
| **RPD** | 10.37037 | 7.5829384 | 6.0606061 | 8.4735202 | 7.5757576 | 16.901408 | 0 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Se** | **Sr** | **Te** | **Th** | **Ti** | **Tl** | **U** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **SI** | **0.1** | **7.9** | **< .02** | **< .1** | **< .001** | **< .02** | **0.01** |
| **LDL** | **0.1** | **0.5** | **0.02** | **0.1** | **0.001** | **0.02** | **0.1** |
| **SAMPLES** | | | | | | | |
| **201** | 9.1 | 199.9 | 0.15 | 3.3 | < .001 | 2.68 | 10.26 |
| **6155 (RE 201)** | 10.3 | 213.6 | 0.16 | 4.1 | 0.001 | 2.79 | 11.7 |
| **RPD** | 12.371134 | 6.6263603 | 6.4516129 | 21.621622 | N/A | 4.0219378 | 13.114754 |
| **220** | 2.4 | 118.8 | 0.14 | 7.3 | 0.005 | 0.28 | 3.65 |
| **RE 220** | 2.5 | 119.2 | 0.11 | 7.1 | < .001 | 0.28 | 3.44 |
| **RPD** | 4.0816327 | 0.3361345 | 24 | 2.7777778 | N/A | 0 | 5.9238364 |
| **239** | 4.7 | 181.6 | 0.14 | 3.4 | < .001 | 1.18 | 5.72 |
| **6156 (RE 239)** | 5.3 | 185.4 | 0.15 | 3.8 | < .001 | 1.17 | 6.39 |
| **RPD** | 12 | 2.0708447 | 6.8965517 | 11.111111 | N/A | 0.8510638 | 11.065235 |
| **276** | 2.4 | 196.3 | 0.05 | 16.9 | 0.004 | 0.07 | 6.17 |
| **6157 (RE 276)** | 2.4 | 190.8 | 0.11 | 17.9 | 0.002 | 0.09 | 6.37 |
| **RPD** | 0 | 2.841643 | 75 | 5.7471264 | 66.666667 | 25 | 3.1897927 |
| **280** | 3.6 | 117.3 | 0.09 | 4.2 | 0.001 | 0.09 | 8.22 |
| **RE 280** | 3.7 | 113.6 | 0.08 | 4.2 | < .001 | 0.09 | 7.87 |
| **RPD** | 2.739726 | 3.2048506 | 11.764706 | 0 | N/A | 0 | 4.3505283 |
| **308** | 6.7 | 76.6 | 0.15 | 6 | 0.004 | 0.53 | 3.66 |
| **6158 (RE 308)** | 7.6 | 82.4 | 0.18 | 7.6 | 0.001 | 0.49 | 5.61 |
| **RPD** | 12.587413 | 7.2955975 | 18.181818 | 23.529412 | 120 | 7.8431373 | 42.071197 |
| **310** | 4.2 | 78.8 | 0.14 | 6.3 | < .001 | 0.4 | 2.97 |
| **RE 310** | 4.1 | 77.3 | 0.12 | 6.3 | < .001 | 0.38 | 2.93 |
| **RPD** | 2.4096386 | 1.921845 | 15.384615 | 0 | N/A | 5.1282051 | 1.3559322 |
| **341** | 2.5 | 94.2 | 0.05 | 4.9 | < .001 | 0.21 | 1.62 |
| **6159 (RE 341)** | 3.1 | 99 | 0.08 | 5.6 | 0.001 | 0.28 | 1.67 |
| **RPD** | 21.428571 | 4.9689441 | 46.153846 | 13.333333 | N/A | 28.571429 | 3.0395137 |
| **359** | 1.7 | 88.3 | 0.09 | 4.9 | < .001 | 0.09 | 1.85 |
| **RE 359** | 1.7 | 90.2 | 0.06 | 4.9 | < .001 | 0.09 | 1.89 |
| **RPD** | 0 | 2.1288515 | 40 | 0 | N/A | 0 | 2.1390374 |
| **371** | 2.2 | 74.4 | 0.11 | 4.6 | < .001 | 0.22 | 1.89 |
| **6160 (RE 371)** | 2.8 | 77.3 | 0.08 | 5.2 | 0.001 | 0.21 | 2.03 |
| **RPD** | 24 | 3.8233355 | 31.578947 | 12.244898 | N/A | 4.6511628 | 7.1428571 |
| **396** | 1.6 | 72 | 0.08 | 5 | 0.001 | 0.1 | 1.22 |
| **RE 396** | 1.6 | 73.8 | 0.07 | 5.1 | 0.001 | 0.11 | 1.23 |
| **RPD** | 0 | 2.4691358 | 13.333333 | 1.980198 | 0 | 9.5238095 | 0.8163265 |
| **399** | 2.1 | 70.4 | 0.08 | 4.9 | 0.001 | 0.09 | 1.94 |
| **6161 (RE 399)** | 2 | 68.8 | 0.11 | 5.2 | 0.001 | 0.13 | 1.19 |
| **RPD** | 4.8780488 | 2.2988506 | 31.578947 | 5.9405941 | 0 | 36.363636 | 47.923323 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | V | W | Zn |
|---|---|---|---|
| | **ppm** | **ppm** | **ppm** |
| **SI** | **< 2** | **0.7** | **0.8** |
| **LDL** | **2** | **0.1** | **0.1** |
| **SAMPLES** | | | |
| **201** | 266 | < .1 | 249.4 |
| **6155 (RE 201)** | 256 | < .1 | 253.2 |
| **RPD** | 3.8314176 | N/A | 1.5121369 |
| | | | |
| **220** | 28 | < .1 | 115.2 |
| **RE 220** | 28 | < .1 | 114.2 |
| **RPD** | 0 | N/A | 0.8718396 |
| | | | |
| **239** | 87 | < .1 | 131 |
| **6156 (RE 239)** | 88 | < .1 | 147.7 |
| **RPD** | 1.1428571 | N/A | 11.984212 |
| | | | |
| **276** | 13 | < .1 | 152.2 |
| **6157 (RE 276)** | 11 | < .1 | 135.9 |
| **RPD** | 16.666667 | N/A | 11.315515 |
| | | | |
| **280** | 61 | < .1 | 131.4 |
| **RE 280** | 58 | < .1 | 126.6 |
| **RPD** | 5.0420168 | N/A | 3.7209302 |
| | | | |
| **308** | 53 | < .1 | 175.4 |
| **6158 (RE 308)** | 51 | < .1 | 217.6 |
| **RPD** | 3.8461538 | N/A | 21.475827 |
| | | | |
| **310** | 41 | < .1 | 165.9 |
| **RE 310** | 41 | < .1 | 169.1 |
| **RPD** | 0 | N/A | 1.9104478 |
| | | | |
| **341** | 49 | < .1 | 131.8 |
| **6159 (RE 341)** | 46 | < .1 | 118.5 |
| **RPD** | 6.3157895 | N/A | 10.627247 |
| | | | |
| **359** | 27 | < .1 | 190.2 |
| **RE 359** | 28 | < .1 | 184.3 |
| **RPD** | 3.6363636 | N/A | 3.1508678 |
| | | | |
| **371** | 33 | < .1 | 155.8 |
| **6160 (RE 371)** | 37 | < .1 | 179 |
| **RPD** | 11.428571 | N/A | 13.85902 |
| | | | |
| **396** | 22 | < .1 | 131.3 |
| **RE 396** | 23 | < .1 | 133.9 |
| **RPD** | 4.4444444 | N/A | 1.9607843 |
| | | | |
| **399** | 27 | < .1 | 106.7 |
| **6161 (RE 399)** | 26 | < .1 | 116.5 |
| **RPD** | 3.7735849 | N/A | 8.781362 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Analysis Date** | **Ag** | **Al** | **As** | **Au** | **B** | **Ba** |
|---|---|---|---|---|---|---|---|
| | | **ppb** | **%** | **ppm** | **ppb** | **ppm** | **ppm** |
| **SI** | | **10** | **0.02** | **0.1** | **0.2** | **2** | **7.5** |
| **LDL** | | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** |
| **SAMPLES** | | | | | | | |
| **427** | Dec. 2003 | 59 | 0.34 | 4.4 | 1 | 4 | 531.3 |
| **6162 (RE 427)** | | 62 | 0.43 | 4.4 | 0.2 | 5 | 548.5 |
| **RPD** | | 4.9586777 | 23.376623 | 0 | 133.33333 | 22.222222 | 3.1857751 |
| **436** | Dec. 2003 | 388 | 1.27 | 2.8 | 1.4 | 15 | 402.6 |
| **RE 436** | | 393 | 1.29 | 3 | 0.8 | 16 | 410.3 |
| **RPD** | | 1.2804097 | 1.5625 | 6.8965517 | 54.545455 | 6.4516129 | 1.894452 |
| **456** | Dec. 2003 | 186 | 0.89 | 20.8 | 0.4 | 8 | 62.2 |
| **6163 (RE 456)** | | 197 | 1.09 | 22.8 | 0.6 | 9 | 56.6 |
| **RPD** | | 5.7441253 | 20.20202 | 9.1743119 | 40 | 11.764706 | 9.4276094 |
| **470** | Dec. 2003 | 308 | 0.55 | 36.2 | 0.5 | 9 | 55.4 |
| **RE 470** | | 305 | 0.54 | 35.5 | 0.4 | 8 | 58.3 |
| **RPD** | | 0.9787928 | 1.8348624 | 1.9525802 | 22.222222 | 11.764706 | 5.1011434 |
| **482** | Dec. 2003 | 304 | 0.58 | 35.2 | 0.2 | 11 | 63 |
| **6164 (RE 482)** | | 321 | 0.76 | 38.6 | 0.2 | 9 | 44.6 |
| **RPD** | | 5.44 | 26.865672 | 9.2140921 | 0 | 20 | 34.200743 |
| **500** | Dec. 2003 | 269 | 0.6 | 25.3 | 0.4 | 7 | 44.8 |
| **RE 500** | | 261 | 0.59 | 24.7 | *0.1* | 7 | 43 |
| **RPD** | | 3.0188679 | 1.6806723 | 2.4 | 120 | 0 | 4.1002278 |
| **3813** | Dec. 2003 | 268 | 0.58 | 29.9 | 0.3 | 7 | 43 |
| **6165 (RE 3813)** | | 261 | 0.73 | 30.8 | 0.3 | 8 | 44.2 |
| **RPD** | | 2.6465028 | 22.900763 | 2.9654036 | 0 | 13.333333 | 2.7522936 |
| **3838** | Dec. 2003 | 232 | 0.8 | 24.4 | 0.4 | 8 | 78.5 |
| **6166 (RE 3838)** | | 242 | 0.97 | 24.9 | 0.4 | 9 | 50.7 |
| **RPD** | | 4.2194093 | 19.20904 | 2.0283976 | 0 | 11.764706 | 43.034056 |
| **3840** | Dec. 2003 | 213 | 0.82 | 23.4 | 0.5 | 10 | 74.2 |
| **RE 3840** | | 208 | 0.82 | 23.8 | 0.5 | 7 | 71.5 |
| **RPD** | | 2.3752969 | 0 | 1.6949153 | 0 | 35.294118 | 3.7062457 |
| **3871** | Dec. 2003 | 204 | 1.15 | 15.1 | 0.4 | 12 | 64 |
| **6167 (RE 3871)** | | 218 | 1.08 | 15.5 | *0.1* | 11 | 56.5 |
| **RPD** | | 6.6350711 | 6.2780269 | 2.6143791 | 120 | 8.6956522 | 12.448133 |
| **3880** | Dec. 2003 | 233 | 0.66 | 19 | 0.4 | 11 | 77.2 |
| **RE 3880** | | 231 | 0.68 | 19.9 | 0.4 | 13 | 81.7 |
| **RPD** | | 0.862069 | 2.9850746 | 4.6272494 | 0 | 16.666667 | 5.6639396 |
| **3901** | Dec. 2003 | 228 | 0.91 | 11.1 | *0.1* | 9 | 590.8 |
| **6168 (RE 3901)** | | 223 | 0.87 | 10.8 | *0.1* | 11 | 610.9 |
| **RPD** | | 2.2172949 | 4.494382 | 2.739726 | 0 | 20 | 3.3452609 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Bi** | **Ca** | **Cd** | **Co** | **Cr** | **Cu** | **Fe** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **SI** | **0.03** | **0.39** | **0.01** | **0.1** | **0.7** | **1.15** | **0.05** |
| **LDL** | **0.02** | **0.01** | **0.01** | **0.1** | **0.5** | **0.01** | **0.01** |
| **SAMPLES** | | | | | | | |
| **427** | 0.04 | 11.93 | 0.22 | 6.9 | 14.7 | 6.43 | 1.89 |
| **6162 (RE 427)** | 0.04 | 11.36 | 0.23 | 5.9 | 12.5 | 6.15 | 1.95 |
| **RPD** | 0 | 4.8948046 | 4.4444444 | 15.625 | 16.176471 | 4.4515103 | 3.125 |
| **436** | 0.28 | 0.44 | 0.75 | 17.5 | 30.8 | 52.58 | 2.88 |
| **RE 436** | 0.29 | 0.45 | 0.74 | 17.3 | 31.5 | 52.83 | 2.91 |
| **RPD** | 3.5087719 | 2.247191 | 1.3422819 | 1.1494253 | 2.247191 | 0.4743383 | 1.0362694 |
| **456** | 0.24 | 2.21 | 0.42 | 12 | 15.2 | 26.99 | 2.96 |
| **6163 (RE 456)** | 0.26 | 2.53 | 0.41 | 13 | 17.9 | 29.33 | 3.15 |
| **RPD** | 8 | 13.50211 | 2.4096386 | 8 | 16.314199 | 8.3096591 | 6.2193126 |
| **470** | 0.35 | 4.56 | 0.92 | 15.5 | 9.6 | 38.97 | 2.95 |
| **RE 470** | 0.31 | 4.49 | 0.97 | 15.3 | 9.3 | 38.06 | 2.91 |
| **RPD** | 12.121212 | 1.5469613 | 5.2910053 | 1.2987013 | 3.1746032 | 2.3627158 | 1.3651877 |
| **482** | 0.27 | 5.66 | 1.11 | 16 | 10 | 35.68 | 2.9 |
| **6164 (RE 482)** | 0.3 | 5.04 | 1.19 | 17.9 | 11.9 | 40.31 | 3.17 |
| **RPD** | 10.526316 | 11.588785 | 6.9565217 | 11.20944 | 17.351598 | 12.185814 | 8.8962109 |
| **500** | 0.25 | 4.41 | 1.28 | 14.6 | 10.7 | 38.84 | 3.49 |
| **RE 500** | 0.24 | 4.24 | 1.28 | 13.9 | 10 | 38.09 | 3.35 |
| **RPD** | 4.0816327 | 3.9306358 | 0 | 4.9122807 | 6.763285 | 1.9498245 | 4.0935673 |
| **3813** | 0.28 | 3.73 | 0.93 | 15 | 10.7 | 33.86 | 2.96 |
| **6165 (RE 3813)** | 0.3 | 3.46 | 0.94 | 14.5 | 12.1 | 34.43 | 2.96 |
| **RPD** | 6.8965517 | 7.5104312 | 1.0695187 | 3.3898305 | 12.280702 | 1.6693513 | 0 |
| **3838** | 0.24 | 1.55 | 0.65 | 13.8 | 13.6 | 32.47 | 2.83 |
| **6166 (RE 3838)** | 0.23 | 1.62 | 0.63 | 14.8 | 14.7 | 33.04 | 2.89 |
| **RPD** | 4.2553191 | 4.4164038 | 3.125 | 6.993007 | 7.7738516 | 1.7401923 | 2.0979021 |
| **3840** | 0.26 | 1.99 | 0.6 | 13 | 13.3 | 32.54 | 2.89 |
| **RE 3840** | 0.25 | 2 | 0.6 | 13.1 | 13.3 | 33.11 | 2.9 |
| **RPD** | 3.9215686 | 0.5012531 | 0 | 0.7662835 | 0 | 1.7364813 | 0.3454231 |
| **3871** | 0.33 | 0.52 | 0.21 | 12.3 | 18.6 | 35.06 | 2.99 |
| **6167 (RE 3871)** | 0.33 | 0.63 | 0.25 | 12.4 | 17.2 | 34.16 | 2.85 |
| **RPD** | 0 | 19.130435 | 17.391304 | 0.8097166 | 7.8212291 | 2.6004045 | 4.7945205 |
| **3880** | 0.22 | 2.63 | 0.42 | 9.5 | 13.8 | 25.71 | 3.1 |
| **RE 3880** | 0.24 | 2.69 | 0.42 | 9.7 | 14.1 | 26.46 | 3.15 |
| **RPD** | 8.6956522 | 2.2556391 | 0 | 2.0833333 | 2.1505376 | 2.8752156 | 1.6 |
| **3901** | 0.21 | 0.22 | 0.17 | 9.7 | 17.1 | 28.08 | 1.44 |
| **6168 (RE 3901)** | 0.2 | 0.26 | 0.16 | 9.4 | 15.3 | 28.04 | 1.33 |
| **RPD** | 4.8780488 | 16.666667 | 6.0606061 | 3.1413613 | 11.111111 | 0.1425517 | 7.9422383 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Ga** | **Hg** | **K** | **La** | **Mg** | **Mn** | **Mo** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **ppb** | **%** | **ppm** | **%** | **ppm** | **ppm** |
| **SI** | **0.1** | **14** | **0.01** | **< .5** | **0.01** | **10** | **0.05** |
| **LDL** | **0.1** | **5** | **0.01** | **0.5** | **0.01** | **1** | **0.01** |
| **SAMPLES** | | | | | | | |
| **427** | 1.8 | 31 | 0.07 | 10.2 | 0.66 | 466 | 0.13 |
| **6162 (RE 427)** | 1.8 | 38 | 0.09 | 10.4 | 0.72 | 478 | 0.16 |
| **RPD** | 0 | 20.289855 | 25 | 1.9417476 | 8.6956522 | 2.5423729 | 20.689655 |
| **436** | 6 | 156 | 0.22 | 17.5 | 0.62 | 465 | 2.43 |
| **RE 436** | 6.1 | 146 | 0.24 | 18 | 0.63 | 475 | 2.36 |
| **RPD** | 1.6528926 | 6.6225166 | 8.6956522 | 2.8169014 | 1.6 | 2.1276596 | 2.9227557 |
| **456** | 2.4 | 59 | 0.26 | 2.8 | 0.55 | 86 | 2.69 |
| **6163 (RE 456)** | 3 | 74 | 0.31 | 3.6 | 0.66 | 99 | 2.78 |
| **RPD** | 22.222222 | 22.556391 | 17.54386 | 25 | 18.181818 | 14.054054 | 3.2906764 |
| **470** | 1.6 | 106 | 0.19 | 3.6 | 0.42 | 68 | 9.2 |
| **RE 470** | 1.6 | 97 | 0.19 | 3.5 | 0.42 | 71 | 9.44 |
| **RPD** | 0 | 8.8669951 | 0 | 2.8169014 | 0 | 4.3165468 | 2.5751073 |
| **482** | 1.7 | 103 | 0.22 | 3.8 | 0.42 | 76 | 12.53 |
| **6164 (RE 482)** | 2.1 | 98 | 0.26 | 4.6 | 0.46 | 80 | 13.08 |
| **RPD** | 21.052632 | 4.9751244 | 16.666667 | 19.047619 | 9.0909091 | 5.1282051 | 4.2951972 |
| **500** | 1.8 | 74 | 0.2 | 3.5 | 0.54 | 105 | 8.8 |
| **RE 500** | 1.7 | 69 | 0.19 | 3.4 | 0.52 | 106 | 8.64 |
| **RPD** | 5.7142857 | 6.993007 | 5.1282051 | 2.8985507 | 3.7735849 | 0.9478673 | 1.8348624 |
| **3813** | 1.7 | 81 | 0.2 | 3.1 | 0.48 | 73 | 9.93 |
| **6165 (RE 3813)** | 2 | 92 | 0.23 | 3.7 | 0.49 | 84 | 9.15 |
| **RPD** | 16.216216 | 12.716763 | 13.953488 | 17.647059 | 2.0618557 | 14.012739 | 8.1761006 |
| **3838** | 2.4 | 63 | 0.23 | 2.9 | 0.48 | 83 | 6.53 |
| **6166 (RE 3838)** | 2.7 | 63 | 0.31 | 3.3 | 0.51 | 90 | 7.19 |
| **RPD** | 11.764706 | 0 | 29.62963 | 12.903226 | 6.0606061 | 8.0924855 | 9.6209913 |
| **3840** | 2.4 | 53 | 0.22 | 3.1 | 0.56 | 87 | 5.56 |
| **RE 3840** | 2.4 | 61 | 0.22 | 3.1 | 0.56 | 87 | 5.73 |
| **RPD** | 0 | 14.035088 | 0 | 0 | 0 | 0 | 3.0115146 |
| **3871** | 3.5 | 114 | 0.3 | 4.4 | 0.36 | 83 | 1.82 |
| **6167 (RE 3871)** | 3.3 | 97 | 0.31 | 4.1 | 0.36 | 78 | 1.97 |
| **RPD** | 5.8823529 | 16.113744 | 3.2786885 | 7.0588235 | 0 | 6.2111801 | 7.9155673 |
| **3880** | 2.3 | 85 | 0.19 | 4.7 | 0.42 | 88 | 5.51 |
| **RE 3880** | 2.4 | 84 | 0.2 | 4.9 | 0.43 | 91 | 5.61 |
| **RPD** | 4.2553191 | 1.183432 | 5.1282051 | 4.1666667 | 2.3529412 | 3.3519553 | 1.7985612 |
| **3901** | 2.8 | 73 | 0.26 | 4.8 | 0.27 | 60 | 1.11 |
| **6168 (RE 3901)** | 2.5 | 82 | 0.23 | 4.5 | 0.26 | 51 | 0.99 |
| **RPD** | 11.320755 | 11.612903 | 12.244898 | 6.4516129 | 3.7735849 | 16.216216 | 11.428571 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Na** | **Ni** | **P** | **Pb** | **S** | **Sb** | **Sc** |
|---|---|---|---|---|---|---|---|
| | **%** | **ppm** | **%** | **ppm** | **%** | **ppm** | **ppm** |
| **SI** | **1.421** | **0.1** | **< .001** | **1.63** | **0.02** | **0.18** | **0.3** |
| **LDL** | **0.001** | **0.1** | **0.001** | **0.01** | **0.02** | **0.02** | **0.1** |
| **SAMPLES** | | | | | | | |
| **427** | 0.057 | 24.8 | 0.047 | 3.7 | 0.03 | 0.25 | 2.7 |
| **6162 (RE 427)** | 0.063 | 23.2 | 0.055 | 4.17 | 0.04 | 0.23 | 2.4 |
| **RPD** | 10 | 6.6666667 | 15.686275 | 11.944091 | 28.571429 | 8.3333333 | 11.764706 |
| **436** | 0.309 | 77 | 0.086 | 15.97 | 0.07 | 0.94 | 6.2 |
| **RE 436** | 0.316 | 76 | 0.089 | 16.25 | 0.08 | 0.87 | 6.4 |
| **RPD** | 2.24 | 1.3071895 | 3.4285714 | 1.7380509 | 13.333333 | 7.7348066 | 3.1746032 |
| **456** | 0.211 | 35.8 | 0.067 | 14.99 | 2.46 | 0.55 | 5.1 |
| **6163 (RE 456)** | 0.227 | 39.2 | 0.077 | 16.53 | 2.93 | 0.54 | 6.1 |
| **RPD** | 7.3059361 | 9.0666667 | 13.888889 | 9.7715736 | 17.439703 | 1.8348624 | 17.857143 |
| **470** | 0.166 | 55 | 0.075 | 16.93 | 2.98 | 1.09 | 4.8 |
| **RE 470** | 0.16 | 54.4 | 0.073 | 16.59 | 2.85 | 1.11 | 4.7 |
| **RPD** | 3.6809816 | 1.0968921 | 2.7027027 | 2.0286396 | 4.4596913 | 1.8181818 | 2.1052632 |
| **482** | 0.161 | 58.5 | 0.073 | 15.56 | 3.02 | 1.53 | 4.9 |
| **6164 (RE 482)** | 0.189 | 65.9 | 0.082 | 17.92 | 3.54 | 1.61 | 5.3 |
| **RPD** | 16 | 11.897106 | 11.612903 | 14.097969 | 15.853659 | 5.0955414 | 7.8431373 |
| **500** | 0.166 | 44.3 | 0.07 | 14.57 | 3.17 | 1.18 | 5 |
| **RE 500** | 0.161 | 44.1 | 0.069 | 14.17 | 3.07 | 1.18 | 4.8 |
| **RPD** | 3.058104 | 0.4524887 | 1.4388489 | 2.7835769 | 3.2051282 | 0 | 4.0816327 |
| **3813** | 0.156 | 54 | 0.071 | 15.97 | 2.68 | 1.28 | 4.8 |
| **6165 (RE 3813)** | 0.175 | 53.8 | 0.072 | 17.2 | 3 | 1.27 | 4.8 |
| **RPD** | 11.480363 | 0.3710575 | 1.3986014 | 7.4163401 | 11.267606 | 0.7843137 | 0 |
| **3838** | 0.215 | 47.6 | 0.071 | 15.23 | 2.26 | 0.83 | 5.1 |
| **6166 (RE 3838)** | 0.213 | 48.7 | 0.074 | 15.33 | 2.52 | 0.75 | 5.4 |
| **RPD** | 0.9345794 | 2.2845275 | 4.137931 | 0.6544503 | 10.878661 | 10.126582 | 5.7142857 |
| **3840** | 0.201 | 41.8 | 0.067 | 15.88 | 2.16 | 0.82 | 5.1 |
| **RE 3840** | 0.197 | 42.5 | 0.069 | 15.55 | 2.17 | 0.81 | 5.1 |
| **RPD** | 2.0100503 | 1.6607355 | 2.9411765 | 2.0999045 | 0.4618938 | 1.2269939 | 0 |
| **3871** | 0.236 | 43.1 | 0.06 | 19.03 | 2.08 | 0.37 | 3.7 |
| **6167 (RE 3871)** | 0.237 | 40.9 | 0.059 | 19.13 | 2.19 | 0.36 | 4 |
| **RPD** | 0.422833 | 5.2380952 | 1.6806723 | 0.524109 | 5.1522248 | 2.739726 | 7.7922078 |
| **3880** | 0.15 | 35.2 | 0.073 | 13.72 | 2.19 | 0.39 | 5.3 |
| **RE 3880** | 0.153 | 36.8 | 0.075 | 14.23 | 2.22 | 0.38 | 5.2 |
| **RPD** | 1.980198 | 4.4444444 | 2.7027027 | 3.6493739 | 1.3605442 | 2.5974026 | 1.9047619 |
| **3901** | 0.157 | 29.1 | 0.076 | 13.32 | 0.35 | 0.54 | 3.2 |
| **6168 (RE 3901)** | 0.159 | 26.9 | 0.082 | 12 | 0.31 | 0.51 | 3 |
| **RPD** | 1.2658228 | 7.8571429 | 7.5949367 | 10.42654 | 12.121212 | 5.7142857 | 6.4516129 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Se** | **Sr** | **Te** | **Th** | **Ti** | **Tl** | **U** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **SI** | **0.1** | **7.9** | **< .02** | **< .1** | **< .001** | **< .02** | **0.01** |
| **LDL** | **0.1** | **0.5** | **0.02** | **0.1** | **0.001** | **0.02** | **0.1** |
| **SAMPLES** | | | | | | | |
| **427** | 0.3 | 269.5 | *0.01* | 3 | 0.006 | 0.05 | 0.55 |
| **6162 (RE 427)** | 0.3 | 257.9 | 0.02 | 3 | 0.009 | 0.05 | 0.56 |
| **RPD** | 0 | 4.3989382 | 66.666667 | 0 | 40 | 0 | 1.8018018 |
| **436** | 1.2 | 98.9 | 0.03 | 7.4 | < .001 | 0.14 | 1.57 |
| **RE 436** | 1.2 | 100.6 | 0.04 | 7.6 | < .001 | 0.14 | 1.57 |
| **RPD** | 0 | 1.7042607 | 28.571429 | 2.6666667 | N/A | 0 | 0 |
| **456** | 1.6 | 87 | 0.07 | 4.6 | < .001 | 0.07 | 1.17 |
| **6163 (RE 456)** | 1.8 | 96.4 | 0.1 | 5.2 | 0.001 | 0.06 | 1.33 |
| **RPD** | 11.764706 | 10.250818 | 35.294118 | 12.244898 | N/A | 15.384615 | 12.8 |
| **470** | 2.9 | 105.1 | 0.13 | 4.7 | < .001 | 0.21 | 2.32 |
| **RE 470** | 2.9 | 104.1 | 0.11 | 4.5 | 0.002 | 0.22 | 2.18 |
| **RPD** | 0 | 0.9560229 | 16.666667 | 4.3478261 | N/A | 4.6511628 | 6.2222222 |
| **482** | 3.7 | 144.9 | 0.12 | 4.5 | < .001 | 0.2 | 2.72 |
| **6164 (RE 482)** | 4.4 | 141.9 | 0.2 | 5.4 | < .001 | 0.2 | 2.9 |
| **RPD** | 17.283951 | 2.0920502 | 50 | 18.181818 | N/A | 0 | 6.405694 |
| **500** | 3.5 | 114.2 | 0.1 | 4.1 | < .001 | 0.09 | 2.6 |
| **RE 500** | 3.4 | 109.6 | 0.15 | 4 | < .001 | 0.08 | 2.52 |
| **RPD** | 2.8985507 | 4.1108132 | 40 | 2.4691358 | N/A | 11.764706 | 3.125 |
| **3813** | 2.8 | 109.7 | 0.12 | 4.5 | < .001 | 0.18 | 1.74 |
| **6165 (RE 3813)** | 3.1 | 112.3 | 0.13 | 5.3 | 0.001 | 0.21 | 1.87 |
| **RPD** | 10.169492 | 2.3423423 | 8 | 16.326531 | N/A | 15.384615 | 7.2022161 |
| **3838** | 1.9 | 85.4 | 0.08 | 4.5 | 0.003 | 0.18 | 1.44 |
| **6166 (RE 3838)** | 2.3 | 84.7 | 0.08 | 4.8 | 0.001 | 0.11 | 1.59 |
| **RPD** | 19.047619 | 0.8230453 | 0 | 6.4516129 | 100 | 48.275862 | 9.9009901 |
| **3840** | 2 | 91.3 | 0.13 | 4.5 | < .001 | 0.15 | 1.23 |
| **RE 3840** | 2 | 91.3 | 0.07 | 4.6 | < .001 | 0.13 | 1.25 |
| **RPD** | 0 | 0 | 60 | 2.1978022 | N/A | 14.285714 | 1.6129032 |
| **3871** | 1.3 | 47.8 | 0.05 | 4.2 | < .001 | 0.08 | 0.79 |
| **6167 (RE 3871)** | 1.4 | 47.5 | 0.07 | 5.2 | 0.001 | 0.07 | 0.9 |
| **RPD** | 7.4074074 | 0.6295908 | 33.333333 | 21.276596 | N/A | 13.333333 | 13.017751 |
| **3880** | 1.5 | 71.2 | 0.06 | 4.2 | 0.001 | 0.18 | 1.86 |
| **RE 3880** | 1.6 | 72.3 | 0.05 | 4.4 | 0.008 | 0.19 | 1.87 |
| **RPD** | 6.4516129 | 1.533101 | 18.181818 | 4.6511628 | 155.55556 | 5.4054054 | 0.536193 |
| **3901** | 1.1 | 41.7 | 0.05 | 4.6 | 0.005 | 0.06 | 0.71 |
| **6168 (RE 3901)** | 1 | 41.9 | 0.06 | 5.2 | 0.001 | 0.06 | 0.79 |
| **RPD** | 9.5238095 | 0.4784689 | 18.181818 | 12.244898 | 133.33333 | 0 | 10.666667 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **V** | **W** | **Zn** |
|---|---|---|---|
| | **ppm** | **ppm** | **ppm** |
| **SI** | **< 2** | **0.7** | **0.8** |
| **LDL** | **2** | **0.1** | **0.1** |
| **SAMPLES** | | | |
| **427** | 22 | < .1 | 49.9 |
| **6162 (RE 427)** | 23 | < .1 | 46.3 |
| **RPD** | 4.4444444 | N/A | 7.4844075 |
| **436** | 46 | < .1 | 166.1 |
| **RE 436** | 47 | < .1 | 169.9 |
| **RPD** | 2.1505376 | N/A | 2.2619048 |
| **456** | 25 | < .1 | 101.1 |
| **6163 (RE 456)** | 32 | < .1 | 115.4 |
| **RPD** | 24.561404 | N/A | 13.210162 |
| **470** | 33 | < .1 | 139.8 |
| **RE 470** | 33 | < .1 | 136.3 |
| **RPD** | 0 | N/A | 2.5353133 |
| **482** | 42 | < .1 | 133.2 |
| **6164 (RE 482)** | 48 | < .1 | 146.5 |
| **RPD** | 13.333333 | N/A | 9.5101895 |
| **500** | 25 | < .1 | 143.2 |
| **RE 500** | 25 | < .1 | 142 |
| **RPD** | 0 | N/A | 0.8415147 |
| **3813** | 38 | < .1 | 134.1 |
| **6165 (RE 3813)** | 40 | < .1 | 140.5 |
| **RPD** | 5.1282051 | N/A | 4.6613256 |
| **3838** | 25 | < .1 | 124.2 |
| **6166 (RE 3838)** | 31 | < .1 | 124.9 |
| **RPD** | 21.428571 | N/A | 0.5620233 |
| **3840** | 28 | < .1 | 134.3 |
| **RE 3840** | 29 | < .1 | 129.4 |
| **RPD** | 3.5087719 | N/A | 3.7163443 |
| **3871** | 33 | < .1 | 110 |
| **6167 (RE 3871)** | 32 | < .1 | 124.3 |
| **RPD** | 3.0769231 | N/A | 12.206573 |
| **3880** | 33 | < .1 | 119 |
| **RE 3880** | 36 | < .1 | 128.6 |
| **RPD** | 8.6956522 | N/A | 7.7544426 |
| **3901** | 32 | < .1 | 137.9 |
| **6168 (RE 3901)** | 29 | < .1 | 136.3 |
| **RPD** | 9.8360656 | N/A | 1.1670314 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Analysis Date** | **Ag**<br>**ppb** | **Al**<br>**%** | **As**<br>**ppm** | **Au**<br>**ppb** | **B**<br>**ppm** | **Ba**<br>**ppm** |
|---|---|---|---|---|---|---|---|
| **SI** | | **10** | **0.02** | **0.1** | **0.2** | **2** | **7.5** |
| **LDL** | | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** |
| **SAMPLES** | | | | | | | |
| **3924** | Dec. 2003 | 81 | 1.22 | 10.4 | 0.4 | 14 | 364 |
| **RE 3924** | | 86 | 1.23 | 10.6 | 0.4 | 14 | 360.6 |
| **RPD** | | 5.988024 | 0.8163265 | 1.9047619 | 0 | 0 | 0.9384488 |
| **3933** | Dec. 2003 | 166 | 1.55 | 90.4 | 1.1 | 16 | 431.2 |
| **6169 (RE 3933)** | | 216 | 1.5 | 72.5 | 0.4 | 16 | 516 |
| **RPD** | | 26.17801 | 3.2786885 | 21.976673 | 93.333333 | 0 | 17.905405 |
| **3958** | Dec. 2003 | 144 | 0.28 | 8.9 | 1.1 | 9 | 134.7 |
| **6170 (RE 3958)** | | 146 | 0.51 | 10.9 | 1.3 | 11 | 165.4 |
| **RPD** | | 1.3793103 | 58.227848 | 20.20202 | 16.666667 | 20 | 20.459847 |
| **3970** | Dec. 2003 | 289 | 0.99 | 21.9 | 0.3 | 19 | 68.3 |
| **RE 3970** | | 289 | 1 | 22.1 | 0.9 | 20 | 76.3 |
| **RPD** | | 0 | 1.0050251 | 0.9090909 | 100 | 5.1282051 | 11.065007 |
| **4530** | Dec. 2003 | 182 | 0.76 | 22.6 | *0.1* | 7 | 54.9 |
| **6171 (RE 4530)** | | 203 | 0.85 | 23.6 | 0.5 | 8 | 52 |
| **RPD** | | 10.909091 | 11.180124 | 4.3290043 | 133.33333 | 13.333333 | 5.4256314 |
| **4544** | Dec. 2003 | 321 | 0.96 | 29.1 | 1 | 12 | 53.5 |
| **RE 4544** | | 311 | 0.99 | 30.2 | 0.5 | 13 | 54.1 |
| **RPD** | | 3.164557 | 3.0769231 | 3.7099494 | 66.666667 | 8 | 1.1152416 |
| **4561** | Dec. 2003 | 254 | 1.09 | 38.7 | 0.8 | 9 | 36.9 |
| **6172 (RE 4561)** | | 292 | 1.03 | 41.6 | 1.4 | 11 | 55.6 |
| **RPD** | | 13.919414 | 5.6603774 | 7.2229141 | 54.545455 | 20 | 40.432432 |
| **4584** | Dec. 2003 | 300 | 1.03 | 29.3 | 0.5 | 13 | 43.9 |
| **6173 (RE 4584)** | | 324 | 0.95 | 30.5 | 0.4 | 10 | 48.6 |
| **RPD** | | 7.6923077 | 8.0808081 | 4.0133779 | 22.222222 | 26.086957 | 10.162162 |
| **6033** | Dec. 2003 | 177 | 0.88 | 16.8 | 1.8 | 14 | 115.7 |
| **6174 (RE 6033)** | | 175 | 0.95 | 18.2 | 1.2 | 13 | 151.9 |
| **RPD** | | 1.1363636 | 7.6502732 | 8 | 40 | 7.4074074 | 27.055306 |
| **6092** | Dec. 2003 | 190 | 1.85 | 51.9 | 3.9 | 8 | 3.8 |
| **RE 6092** | | 175 | 1.83 | 50.1 | 3.7 | 7 | 6 |
| **RPD** | | 8.2191781 | 1.0869565 | 3.5294118 | 5.2631579 | 13.333333 | 44.897959 |
| **6168 (RE 3901)** | Dec. 2003 | 223 | 0.87 | 10.8 | *0.1* | 11 | 610.9 |
| **RE 6168** | | 229 | 0.89 | 11.2 | 0.5 | 11 | 630.1 |
| **RPD** | | 2.6548673 | 2.2727273 | 3.6363636 | 133.33333 | 0 | 3.0942788 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Bi** | **Ca** | **Cd** | **Co** | **Cr** | **Cu** | **Fe** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **SI** | **0.03** | **0.39** | **0.01** | **0.1** | **0.7** | **1.15** | **0.05** |
| **LDL** | **0.02** | **0.01** | **0.01** | **0.1** | **0.5** | **0.01** | **0.01** |
| **SAMPLES** | | | | | | | |
| **3924** | 0.24 | 0.16 | 0.07 | 11.5 | 24 | 21.32 | 1.98 |
| **RE 3924** | 0.24 | 0.16 | 0.07 | 11.2 | 24.1 | 21.2 | 1.99 |
| **RPD** | 0 | 0 | 0 | 2.6431718 | 0.4158004 | 0.5644403 | 0.5037783 |
| **3933** | 0.34 | 0.21 | 0.05 | 23.9 | 27.9 | 26.81 | 2.54 |
| **6169 (RE 3933)** | 0.32 | 0.21 | 0.08 | 29 | 25.6 | 25.31 | 2.25 |
| **RPD** | 6.0606061 | 0 | 46.153846 | 19.281664 | 8.5981308 | 5.7559478 | 12.108559 |
| **3958** | 0.06 | 7.81 | 0.3 | 2.7 | 10.2 | 10.22 | 1.41 |
| **6170 (RE 3958)** | 0.06 | 7.13 | 0.31 | 3.7 | 10.9 | 10.78 | 1.57 |
| **RPD** | 0 | 9.103079 | 3.2786885 | 31.25 | 6.6350711 | 5.3333333 | 10.738255 |
| **3970** | 0.42 | 0.6 | 0.46 | 11.3 | 19.7 | 47.97 | 2.45 |
| **RE 3970** | 0.38 | 0.59 | 0.46 | 11.4 | 20 | 47.97 | 2.43 |
| **RPD** | 10 | 1.6806723 | 0 | 0.8810573 | 1.511335 | 0 | 0.8196721 |
| **4530** | 0.23 | 1.99 | 0.53 | 12.3 | 13.9 | 30.06 | 2.57 |
| **6171 (RE 4530)** | 0.25 | 2.22 | 0.63 | 12.6 | 13.8 | 30.94 | 2.73 |
| **RPD** | 8.3333333 | 10.926366 | 17.241379 | 2.4096386 | 0.7220217 | 2.8852459 | 6.0377358 |
| **4544** | 0.25 | 5.47 | 1.36 | 17.1 | 17.5 | 39.96 | 3.05 |
| **RE 4544** | 0.25 | 5.49 | 1.36 | 16.9 | 18.2 | 40.06 | 3.09 |
| **RPD** | 0 | 0.3649635 | 0 | 1.1764706 | 3.9215686 | 0.2499375 | 1.3029316 |
| **4561** | 0.31 | 1 | 1.22 | 15.8 | 20.1 | 37.8 | 3.47 |
| **6172 (RE 4561)** | 0.32 | 0.96 | 1.68 | 17.2 | 19 | 41.36 | 3.44 |
| **RPD** | 3.1746032 | 4.0816327 | 31.724138 | 8.4848485 | 5.6265985 | 8.9944416 | 0.8683068 |
| **4584** | 0.33 | 0.69 | 0.9 | 14.7 | 21.4 | 42.13 | 3.15 |
| **6173 (RE 4584)** | 0.34 | 0.76 | 1.28 | 15.7 | 20.4 | 44.36 | 3.19 |
| **RPD** | 2.9850746 | 9.6551724 | 34.862385 | 6.5789474 | 4.784689 | 5.1566655 | 1.2618297 |
| **6033** | 0.28 | 0.8 | 0.47 | 9.1 | 16.2 | 39.55 | 1.86 |
| **6174 (RE 6033)** | 0.34 | 0.35 | 0.35 | 8.8 | 18.2 | 44.88 | 2 |
| **RPD** | 19.354839 | 78.26087 | 29.268293 | 3.3519553 | 11.627907 | 12.625844 | 7.253886 |
| **6092** | 0.2 | 0.57 | 1.05 | 4.9 | 4.5 | 23.55 | 18.26 |
| **RE 6092** | 0.2 | 0.59 | 1.05 | 4.5 | 4.2 | 21.54 | 18.63 |
| **RPD** | 0 | 3.4482759 | 0 | 8.5106383 | 6.8965517 | 8.9155023 | 2.0059637 |
| **6168 (RE 3901)** | 0.2 | 0.26 | 0.16 | 9.4 | 15.3 | 28.04 | 1.33 |
| **RE 6168** | 0.21 | 0.26 | 0.18 | 9.9 | 15.1 | 29.15 | 1.34 |
| **RPD** | 4.8780488 | 0 | 11.764706 | 5.1813472 | 1.3157895 | 3.8817975 | 0.7490637 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Ga** | **Hg** | **K** | **La** | **Mg** | **Mn** | **Mo** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **ppb** | **%** | **ppm** | **%** | **ppm** | **ppm** |
| **SI** | **0.1** | **14** | **0.01** | **< .5** | **0.01** | **10** | **0.05** |
| **LDL** | **0.1** | **5** | **0.01** | **0.5** | **0.01** | **1** | **0.01** |
| **SAMPLES** | | | | | | | |
| **3924** | 4.1 | 73 | 0.29 | 5.3 | 0.38 | 71 | 0.36 |
| **RE 3924** | 4.1 | 82 | 0.29 | 5.4 | 0.38 | 74 | 0.35 |
| **RPD** | 0 | 11.612903 | 0 | 1.8691589 | 0 | 4.137931 | 2.8169014 |
| **3933** | 6 | 79 | 0.43 | 9.6 | 0.39 | 131 | 0.69 |
| **6169 (RE 3933)** | 5.3 | 83 | 0.41 | 9.4 | 0.36 | 105 | 0.91 |
| **RPD** | 12.389381 | 4.9382716 | 4.7619048 | 2.1052632 | 8 | 22.033898 | 27.5 |
| **3958** | 1.5 | 124 | 0.1 | 7.1 | 3.56 | 174 | 1.92 |
| **6170 (RE 3958)** | 2 | 190 | 0.16 | 7.3 | 3.39 | 186 | 1.93 |
| **RPD** | 28.571429 | 42.038217 | 46.153846 | 2.7777778 | 4.8920863 | 6.6666667 | 0.5194805 |
| **3970** | 4 | 110 | 0.27 | 9.9 | 0.4 | 72 | 7.76 |
| **RE 3970** | 4.1 | 119 | 0.28 | 10.2 | 0.4 | 72 | 7.68 |
| **RPD** | 2.4691358 | 7.860262 | 3.6363636 | 2.9850746 | 0 | 0 | 1.0362694 |
| **4530** | 2.1 | 66 | 0.22 | 2.8 | 0.48 | 79 | 3.54 |
| **6171 (RE 4530)** | 2.3 | 83 | 0.25 | 3.1 | 0.54 | 80 | 3.77 |
| **RPD** | 9.0909091 | 22.818792 | 12.765957 | 10.169492 | 11.764706 | 1.2578616 | 6.2927497 |
| **4544** | 4.5 | 156 | 0.32 | 7.9 | 0.56 | 92 | 10.71 |
| **RE 4544** | 4.5 | 144 | 0.33 | 7.8 | 0.57 | 88 | 10.9 |
| **RPD** | 0 | 8 | 3.0769231 | 1.2738854 | 1.7699115 | 4.4444444 | 1.7584452 |
| **4561** | 4.1 | 576 | 0.29 | 5.2 | 0.34 | 81 | 15.54 |
| **6172 (RE 4561)** | 4 | 508 | 0.3 | 5.4 | 0.36 | 77 | 16.4 |
| **RPD** | 2.4691358 | 12.546125 | 3.3898305 | 3.7735849 | 5.7142857 | 5.0632911 | 5.3850971 |
| **4584** | 4.4 | 481 | 0.28 | 6.4 | 0.23 | 92 | 20.21 |
| **6173 (RE 4584)** | 4.3 | 188 | 0.26 | 6.2 | 0.23 | 88 | 24.06 |
| **RPD** | 2.2988506 | 87.593423 | 7.4074074 | 3.1746032 | 0 | 4.4444444 | 17.393269 |
| **6033** | 3.4 | 178 | 0.26 | 22.7 | 0.25 | 104 | 2.96 |
| **6174 (RE 6033)** | 3.7 | 163 | 0.27 | 12.6 | 0.27 | 97 | 3.64 |
| **RPD** | 8.4507042 | 8.797654 | 3.7735849 | 57.223796 | 7.6923077 | 6.9651741 | 20.606061 |
| **6092** | 1.9 | 113 | 0.21 | *0.25* | 0.22 | 273 | 27.76 |
| **RE 6092** | 1.8 | 96 | 0.19 | *0.25* | 0.22 | 278 | 25.7 |
| **RPD** | 5.4054054 | 16.267943 | 10 | 0 | 0 | 1.814882 | 7.7066966 |
| **6168 (RE 3901)** | 2.5 | 82 | 0.23 | 4.5 | 0.26 | 51 | 0.99 |
| **RE 6168** | 2.6 | 87 | 0.24 | 4.9 | 0.26 | 52 | 1.04 |
| **RPD** | 3.9215686 | 5.9171598 | 4.2553191 | 8.5106383 | 0 | 1.9417476 | 4.9261084 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Na** | **Ni** | **P** | **Pb** | **S** | **Sb** | **Sc** |
|---|---|---|---|---|---|---|---|
| | **%** | **ppm** | **%** | **ppm** | **%** | **ppm** | **ppm** |
| **SI** | **1.421** | **0.1** | **< .001** | **1.63** | **0.02** | **0.18** | **0.3** |
| **LDL** | **0.001** | **0.1** | **0.001** | **0.01** | **0.02** | **0.02** | **0.1** |
| **SAMPLES** | | | | | | | |
| **3924** | 0.199 | 30.5 | 0.067 | 13.61 | 0.43 | 0.2 | 3.6 |
| **RE 3924** | 0.201 | 31 | 0.068 | 13.47 | 0.41 | 0.2 | 3.7 |
| **RPD** | 1 | 1.6260163 | 1.4814815 | 1.0339734 | 4.7619048 | 0 | 2.739726 |
| **3933** | 0.272 | 39.3 | 0.074 | 19.41 | 0.53 | 0.2 | 4.4 |
| **6169 (RE 3933)** | 0.239 | 40 | 0.07 | 18.88 | 0.45 | 0.22 | 3.7 |
| **RPD** | 12.915851 | 1.7654477 | 5.5555556 | 2.7683468 | 16.326531 | 9.5238095 | 17.283951 |
| **3958** | 0.087 | 11 | 0.086 | 3.92 | 0.58 | 0.25 | 1.7 |
| **6170 (RE 3958)** | 0.092 | 11.5 | 0.081 | 4.24 | 0.54 | 0.23 | 1.8 |
| **RPD** | 5.5865922 | 4.4444444 | 5.988024 | 7.8431373 | 7.1428571 | 8.3333333 | 5.7142857 |
| **3970** | 0.287 | 42 | 0.067 | 19.3 | 2.17 | 0.25 | 4.3 |
| **RE 3970** | 0.289 | 43.2 | 0.067 | 19.14 | 2.15 | 0.26 | 4.1 |
| **RPD** | 0.6944444 | 2.8169014 | 0 | 0.8324662 | 0.9259259 | 3.9215686 | 4.7619048 |
| **4530** | 0.2 | 39.1 | 0.065 | 14.35 | 1.96 | 0.66 | 4.4 |
| **6171 (RE 4530)** | 0.208 | 39.6 | 0.07 | 16.09 | 2.37 | 0.73 | 4.7 |
| **RPD** | 3.9215686 | 1.270648 | 7.4074074 | 11.432326 | 18.937644 | 10.071942 | 6.5934066 |
| **4544** | 0.185 | 52 | 0.061 | 15.02 | 2.44 | 1.12 | 4.4 |
| **RE 4544** | 0.189 | 51.9 | 0.063 | 15.18 | 2.5 | 1.07 | 4.4 |
| **RPD** | 2.1390374 | 0.1924928 | 3.2258065 | 1.0596026 | 2.4291498 | 4.56621 | 0 |
| **4561** | 0.218 | 75.2 | 0.048 | 19.04 | 2.57 | 0.77 | 4.6 |
| **6172 (RE 4561)** | 0.234 | 74.9 | 0.06 | 21.7 | 3.28 | 1.09 | 4.8 |
| **RPD** | 7.079646 | 0.3997335 | 22.222222 | 13.058419 | 24.273504 | 34.408602 | 4.2553191 |
| **4584** | 0.191 | 54.4 | 0.069 | 15.23 | 2.27 | 0.94 | 3.7 |
| **6173 (RE 4584)** | 0.202 | 57.7 | 0.067 | 16.8 | 2.91 | 1.11 | 3.8 |
| **RPD** | 5.5979644 | 5.8876004 | 2.9411765 | 9.8033094 | 24.710425 | 16.585366 | 2.6666667 |
| **6033** | 0.323 | 34.9 | 0.139 | 12.76 | 1.75 | 0.37 | 3.7 |
| **6174 (RE 6033)** | 0.39 | 38.3 | 0.068 | 16.02 | 1.46 | 0.43 | 2.4 |
| **RPD** | 18.793829 | 9.2896175 | 68.599034 | 22.654621 | 18.068536 | 15 | 42.622951 |
| **6092** | 0.398 | 21.2 | 0.037 | 2.09 | 22.09 | 1.34 | 1 |
| **RE 6092** | 0.38 | 19.9 | 0.034 | 1.82 | 20.33 | 1.38 | 0.9 |
| **RPD** | 4.6272494 | 6.3260341 | 8.4507042 | 13.810742 | 8.2979727 | 2.9411765 | 10.526316 |
| **6168 (RE 3901)** | 0.159 | 26.9 | 0.082 | 12 | 0.31 | 0.51 | 3 |
| **RE 6168** | 0.166 | 27.5 | 0.084 | 12.34 | 0.3 | 0.52 | 3.2 |
| **RPD** | 4.3076923 | 2.2058824 | 2.4096386 | 2.7937551 | 3.2786885 | 1.9417476 | 6.4516129 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Se** | **Sr** | **Te** | **Th** | **Ti** | **Tl** | **U** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **SI** | **0.1** | **7.9** | **< .02** | **< .1** | **< .001** | **< .02** | **0.01** |
| **LDL** | **0.1** | **0.5** | **0.02** | **0.1** | **0.001** | **0.02** | **0.1** |
| **SAMPLES** | | | | | | | |
| **3924** | 0.5 | 40.1 | 0.06 | 5 | 0.004 | 0.06 | 0.72 |
| **RE 3924** | 0.4 | 40.5 | 0.08 | 4.9 | 0.002 | 0.06 | 0.74 |
| **RPD** | 22.222222 | 0.9925558 | 28.571429 | 2.020202 | 66.666667 | 0 | 2.739726 |
| **3933** | 0.4 | 63.9 | 0.07 | 6.7 | < .001 | 0.11 | 0.78 |
| **6169 (RE 3933)** | 0.3 | 59.4 | 0.07 | 7.8 | 0.002 | 0.11 | 0.85 |
| **RPD** | 28.571429 | 7.2992701 | 0 | 15.172414 | N/A | 0 | 8.5889571 |
| **3958** | 0.8 | 174.2 | 0.03 | 2.1 | 0.003 | 0.28 | 1.69 |
| **6170 (RE 3958)** | 0.8 | 168 | 0.04 | 2.4 | 0.002 | 0.21 | 1.53 |
| **RPD** | 0 | 3.6236119 | 28.571429 | 13.333333 | 40 | 28.571429 | 9.9378882 |
| **3970** | 2.5 | 91 | 0.06 | 5.6 | < .001 | 0.19 | 3.06 |
| **RE 3970** | 2.5 | 90.6 | 0.1 | 5.5 | 0.006 | 0.2 | 3.01 |
| **RPD** | 0 | 0.4405286 | 50 | 1.8018018 | N/A | 5.1282051 | 1.6474465 |
| **4530** | 1.6 | 73.9 | 0.05 | 4.4 | 0.003 | 0.11 | 1.08 |
| **6171 (RE 4530)** | 1.8 | 86.7 | 0.1 | 5.2 | 0.001 | 0.08 | 1.14 |
| **RPD** | 11.764706 | 15.940224 | 66.666667 | 16.666667 | 100 | 31.578947 | 5.4054054 |
| **4544** | 3.8 | 126 | 0.19 | 4.8 | < .001 | 0.36 | 3.99 |
| **RE 4544** | 3.8 | 127.6 | 0.13 | 4.8 | < .001 | 0.4 | 4.05 |
| **RPD** | 0 | 1.2618297 | 37.5 | 0 | N/A | 10.526316 | 1.4925373 |
| **4561** | 6.4 | 71.7 | 0.17 | 5.2 | < .001 | 0.56 | 2.98 |
| **6172 (RE 4561)** | 7.2 | 75.6 | 0.17 | 5.9 | 0.001 | 0.52 | 3.37 |
| **RPD** | 11.764706 | 5.2953157 | 0 | 12.612613 | N/A | 7.4074074 | 12.283465 |
| **4584** | 2.9 | 63.1 | 0.09 | 5.1 | 0.001 | 0.35 | 5.21 |
| **6173 (RE 4584)** | 3.8 | 64.8 | 0.08 | 5.7 | 0.001 | 0.3 | 5.6 |
| **RPD** | 26.865672 | 2.6583268 | 11.764706 | 11.111111 | 0 | 15.384615 | 7.2155412 |
| **6033** | 3.4 | 101.6 | 0.07 | 7.2 | 0.002 | 0.3 | 4.09 |
| **6174 (RE 6033)** | 3.5 | 87.1 | 0.08 | 6.1 | 0.001 | 0.21 | 2.1 |
| **RPD** | 2.8985507 | 15.368309 | 13.333333 | 16.541353 | 66.666667 | 35.294118 | 64.297254 |
| **6092** | 38.4 | 13.4 | 0.17 | 0.2 | 0.001 | 0.72 | 1.95 |
| **RE 6092** | 36.3 | 12.5 | 0.19 | 0.2 | 0.001 | 0.69 | 1.94 |
| **RPD** | 5.62249 | 6.9498069 | 11.111111 | 0 | 0 | 4.2553191 | 0.5141388 |
| **6168 (RE 3901)** | 1 | 41.9 | 0.06 | 5.2 | 0.001 | 0.06 | 0.79 |
| **RE 6168** | 1.1 | 42.7 | 0.03 | 5.3 | 0.001 | 0.06 | 0.82 |
| **RPD** | 9.5238095 | 1.891253 | 66.666667 | 1.9047619 | 0 | 0 | 3.7267081 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **V** | **W** | **Zn** |
|---|---|---|---|
| | **ppm** | **ppm** | **ppm** |
| **SI** | **< 2** | **0.7** | **0.8** |
| **LDL** | **2** | **0.1** | **0.1** |
| **SAMPLES** | | | |
| **3924** | 34 | < .1 | 102.1 |
| **RE 3924** | 35 | < .1 | 103.7 |
| **RPD** | 2.8985507 | N/A | 1.5549077 |
| **3933** | 45 | < .1 | 116.9 |
| **6169 (RE 3933)** | 44 | < .1 | 122.8 |
| **RPD** | 2.247191 | N/A | 4.9228202 |
| **3958** | 28 | < .1 | 34.6 |
| **6170 (RE 3958)** | 34 | < .1 | 43 |
| **RPD** | 19.354839 | N/A | 21.649485 |
| **3970** | 33 | < .1 | 122.2 |
| **RE 3970** | 35 | < .1 | 123.2 |
| **RPD** | 5.8823529 | N/A | 0.8149959 |
| **4530** | 25 | < .1 | 126.9 |
| **6171 (RE 4530)** | 27 | < .1 | 163.2 |
| **RPD** | 7.6923077 | N/A | 25.025853 |
| **4544** | 63 | < .1 | 121.7 |
| **RE 4544** | 65 | < .1 | 118.7 |
| **RPD** | 3.125 | N/A | 2.4958403 |
| **4561** | 46 | < .1 | 119.6 |
| **6172 (RE 4561)** | 41 | < .1 | 202.9 |
| **RPD** | 11.494253 | N/A | 51.658915 |
| **4584** | 47 | < .1 | 134.9 |
| **6173 (RE 4584)** | 43 | < .1 | 171.8 |
| **RPD** | 8.8888889 | N/A | 24.062602 |
| **6033** | 56 | < .1 | 98.5 |
| **6174 (RE 6033)** | 57 | < .1 | 109.1 |
| **RPD** | 1.7699115 | N/A | 10.211946 |
| **6092** | 42 | < .1 | 51.4 |
| **RE 6092** | 40 | < .1 | 50.3 |
| **RPD** | 4.8780488 | N/A | 2.1632252 |
| **6168 (RE 3901)** | 29 | < .1 | 136.3 |
| **RE 6168** | 30 | < .1 | 141.2 |
| **RPD** | 3.3898305 | N/A | 3.5315315 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| ELEMENT | Ag | Al | As | Au | B | Ba | Bi |
|---|---|---|---|---|---|---|---|
| | ppb | % | ppm | ppb | ppm | ppm | ppm |
| SI | 10 | 0.02 | 0.1 | 0.2 | 2 | 7.5 | 0.03 |
| LDL | 2 | 0.01 | 0.1 | 0.2 | 1 | 0.5 | 0.02 |
| Average RPD | 5.177498512 | 9.0967677 | 6.1045163 | 55.99574 | 15.711088 | 13.792499 | 6.3964738 |
| | | | | 8 samples<br><LDL | | | |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| ELEMENT | Ca | Cd | Co | Cr | Cu | Fe | Ga |
|---|---|---|---|---|---|---|---|
| | % | ppm | ppm | ppm | ppm | % | ppm |
| SI | 0.39 | 0.01 | 0.1 | 0.7 | 1.15 | 0.05 | 0.1 |
| LDL | 0.01 | 0.01 | 0.1 | 0.5 | 0.01 | 0.01 | 0.1 |
| Average RPD | 9.385965754 | 9.923144 | 6.4270258 | 6.7721355 | 4.786243 | 3.9383799 | 7.0675893 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| ELEMENT | Hg | K | La | Mg | Mn | Mo | Na |
|---|---|---|---|---|---|---|---|
| | ppb | % | ppm | % | ppm | ppm | % |
| SI | 14 | 0.01 | < .5 | 0.01 | 10 | 0.05 | 1.421 |
| LDL | 5 | 0.01 | 0.5 | 0.01 | 1 | 0.01 | 0.001 |
| Average RPD | 15.97458536 | 8.7344086 | 8.7317557 | 4.1174874 | 6.3109141 | 6.7283298 | 5.0313761 |
| | | | 1 sample<br><LDL | | | | |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| ELEMENT | Ni | P | Pb | S | Sb | Sc | Se |
|---|---|---|---|---|---|---|---|
| | ppm | % | ppm | % | ppm | ppm | ppm |
| SI | 0.1 | < .001 | 1.63 | 0.02 | 0.18 | 0.3 | 0.1 |
| LDL | 0.1 | 0.001 | 0.01 | 0.02 | 0.02 | 0.1 | 0.1 |
| Average RPD | 4.653329387 | 8.7045429 | 6.9675923 | 10.74824 | 7.1636243 | 6.8446886 | 8.5793399 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| ELEMENT | Sr | Te | Th | Ti | Tl | U | V |
|---|---|---|---|---|---|---|---|
| | ppm | ppm | ppm | % | ppm | ppm | ppm |
| SI | 7.9 | < .02 | < .1 | < .001 | < .02 | 0.01 | < 2 |
| LDL | 0.5 | 0.02 | 0.1 | 0.001 | 0.02 | 0.1 | 2 |
| Average RPD | 3.743625047 | 28.840159 | 8.3574079 | N/A | 11.102461 | 9.5220811 | 6.5117985 |
| | | 1 sample<br><LDL | | Over 25%<br>samples | | | |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

4

| **ELEMENT** | **W** **ppm** | **Zn** **ppm** |
|---|---|---|
| **SI** | **0.7** | **0.8** |
| **LDL** | **0.1** | **0.1** |
| **Average RPD** | N/A | 8.7192441 |
|  | Over 25% samples |  |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Analysis Date** | **Ag** | **Al** | **As** | **Au** | **B** | **Ba** |
|---|---|---|---|---|---|---|---|
|  |  | **ppb** | **%** | **ppm** | **ppb** | **ppm** | **ppm** |
| **SI** |  | **4** | **< .01** | **< .1** | **0.6** | **1** | **2.4** |
| **LDL** |  | **2** | **0.01** | **0.1** | **0.2** | **1** | **0.5** |
| **SAMPLES** |  |  |  |  |  |  |  |
| **221** | Dec. 2003 | 372 | 0.8 | 25.4 | 1.4 | 14 | 72.7 |
| **6175 (RE 221)** |  | 389 | 1.62 | 25 | 1.7 | 16 | 55.9 |
| **RPD** |  | 4.4678055 | 67.768595 | 1.5873016 | 19.354839 | 13.333333 | 26.127527 |
| **242** | Dec. 2003 | 351 | 0.73 | 26.5 | 1.4 | 17 | 91.5 |
| **6176 (RE 242)** |  | 362 | 0.88 | 28 | 0.5 | 20 | 66.9 |
| **RPD** |  | 3.085554 | 18.63354 | 5.5045872 | 94.736842 | 16.216216 | 31.060606 |
| **263** | Dec. 2003 | 138 | 1.04 | 13.1 | 0.4 | 14 | 152.3 |
| **RE 263** |  | 136 | 1.05 | 14.3 | 0.3 | 14 | 159.3 |
| **RPD** |  | 1.459854 | 0.9569378 | 8.7591241 | 28.571429 | 0 | 4.4929397 |
| **320** | Dec. 2003 | 292 | 1.19 | 21.8 | 0.2 | 13 | 77.5 |
| **6177 (RE 320)** |  | 324 | 1.39 | 23.2 | *0.1* | 14 | 58.6 |
| **RPD** |  | 10.38961 | 15.503876 | 6.2222222 | 66.666667 | 7.4074074 | 27.773696 |
| **356** | Dec. 2003 | 279 | 0.79 | 23.8 | 0.6 | 11 | 75.1 |
| **6178 (RE 356)** |  | 272 | 0.86 | 27.2 | 0.4 | 10 | 46.9 |
| **RPD** |  | 2.5408348 | 8.4848485 | 13.333333 | 40 | 9.5238095 | 46.229508 |
| **4566** | Dec. 2003 | 240 | 0.86 | 31 | 0.3 | 13 | 81.5 |
| **6179 (RE 4566)** |  | 236 | 1.27 | 35.6 | *0.1* | 14 | 67 |
| **RPD** |  | 1.6806723 | 38.497653 | 13.813814 | 100 | 7.4074074 | 19.52862 |
| **4577** | Dec. 2003 | 281 | 1.05 | 24.1 | 0.3 | 16 | 73.1 |
| **RE 4577** |  | 269 | 1.08 | 24.4 | 0.4 | 16 | 71.7 |
| **RPD** |  | 4.3636364 | 2.8169014 | 1.2371134 | 28.571429 | 0 | 1.9337017 |
| **6038** | Dec. 2003 | 158 | 1.04 | 5.1 | 0.3 | 18 | 211.5 |
| **6180 (RE 6038)** |  | 164 | 1.28 | 4.5 | 0.4 | 15 | 217.6 |
| **RPD** |  | 3.7267081 | 20.689655 | 12.5 | 28.571429 | 18.181818 | 2.8431601 |
| **6136** | Dec. 2003 | 1067 | 1.79 | 43.4 | 3.3 | 23 | 62.9 |
| **6181 (RE 6136)** |  | 576 | 1.97 | 32.1 | 3.6 | 20 | 68.8 |
| **RPD** |  | 59.768716 | 9.5744681 | 29.933775 | 8.6956522 | 13.953488 | 8.959757 |
| **6154** | Dec. 2003 | 117 | 1.48 | 14.7 | 0.3 | 20 | 97.8 |
| **RE 6154** |  | 116 | 1.49 | 14.8 | 1.2 | 19 | 96.9 |
| **RPD** |  | 0.8583691 | 0.6734007 | 0.6779661 | 120 | 5.1282051 | 0.9244992 |
| **6027** | March 2004 |  |  |  |  |  |  |
| **RE 6027** |  |  |  |  |  |  |  |
| **RPD** |  |  |  |  |  |  |  |
| **Average RPD** |  | 9.234176 | 18.359988 | 9.3569237 | 53.516829 | 9.1151686 | 16.987401 |
|  |  |  |  |  | 2 samples<br><LDL |  |  |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Be** | **Bi** | **Ca** | **Cd** | **Ce** | **Co** | **Cr** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **<.1** | **<.02** | **0.09** | **<.01** | **<.1** | **<.1** | **<.5** |
| **LDL** | **0.1** | **0.02** | **0.01** | **0.01** | **0.1** | **0.1** | **0.5** |
| **SAMPLES** | | | | | | | |
| **221** | 0.6 | 0.41 | 3.72 | 0.8 | 26.5 | 9.6 | 10.4 |
| **6175 (RE 221)** | 0.8 | 0.43 | 4.97 | 0.88 | 42.7 | 8.9 | 14.9 |
| **RPD** | 28.57142857 | 4.7619048 | 28.7687 | 9.5238095 | 46.820809 | 7.5675676 | 35.573123 |
| **242** | 0.6 | 0.32 | 3.47 | 1.38 | 15.3 | 16.9 | 18.1 |
| **6176 (RE 242)** | 0.7 | 0.34 | 2.8 | 1.4 | 16.3 | 16.7 | 20.9 |
| **RPD** | 15.38461538 | 6.0606061 | 21.371611 | 1.4388489 | 6.3291139 | 1.1904762 | 14.358974 |
| **263** | 0.9 | 0.64 | 0.16 | 2.11 | 54.4 | 13.5 | 11.7 |
| **RE 263** | 0.8 | 0.67 | 0.15 | 2.12 | 56.3 | 14.1 | 11.7 |
| **RPD** | 11.76470588 | 4.5801527 | 6.4516129 | 0.4728132 | 3.432701 | 4.3478261 | 0 |
| **320** | 0.8 | 0.29 | 3.58 | 1.41 | 12.2 | 12.4 | 19.2 |
| **6177 (RE 320)** | 0.6 | 0.28 | 4.1 | 1.62 | 12.5 | 13 | 23.1 |
| **RPD** | 28.57142857 | 3.5087719 | 13.541667 | 13.861386 | 2.4291498 | 4.7244094 | 18.439716 |
| **356** | 0.8 | 0.3 | 1.9 | 0.67 | 8 | 11.3 | 13.6 |
| **6178 (RE 356)** | 0.6 | 0.28 | 1.71 | 0.69 | 8.6 | 11.2 | 16.1 |
| **RPD** | 28.57142857 | 6.8965517 | 10.526316 | 2.9411765 | 7.2289157 | 0.8888889 | 16.835017 |
| **4566** | 0.9 | 0.25 | 7.69 | 1.06 | 12.2 | 13.4 | 16.9 |
| **6179 (RE 4566)** | 0.7 | 0.25 | 7.83 | 1 | 16.7 | 14.6 | 23 |
| **RPD** | 25 | 0 | 1.8041237 | 5.8252427 | 31.141869 | 8.5714286 | 30.576441 |
| **4577** | 1.1 | 0.32 | 3.2 | 0.9 | 34.1 | 13.4 | 22.6 |
| **RE 4577** | 0.8 | 0.33 | 3.25 | 0.91 | 34 | 13.7 | 20.9 |
| **RPD** | 31.57894737 | 3.0769231 | 1.5503876 | 1.1049724 | 0.2936858 | 2.2140221 | 7.816092 |
| **6038** | 1.1 | 1.03 | 0.24 | 2.19 | 64.6 | 7.4 | 4.9 |
| **6180 (RE 6038)** | 1.6 | 1.02 | 0.27 | 2.31 | 68.9 | 7.4 | 6.6 |
| **RPD** | 37.03703704 | 0.9756098 | 11.764706 | 5.3333333 | 6.4419476 | 0 | 29.565217 |
| **6136** | 1.1 | 0.43 | 1.78 | 17.58 | 66.7 | 15.6 | 25.1 |
| **6181 (RE 6136)** | 1 | 0.32 | 1.28 | 9.24 | 76.3 | 6.9 | 10.9 |
| **RPD** | 9.523809524 | 29.333333 | 32.679739 | 62.192394 | 13.426573 | 77.333333 | 78.888889 |
| **6154** | 0.8 | 0.39 | 0.24 | 0.13 | 26.7 | 10.8 | 26.8 |
| **RE 6154** | 0.9 | 0.41 | 0.23 | 0.17 | 27.3 | 11 | 26.4 |
| **RPD** | 11.76470588 | 5 | 4.2553191 | 26.666667 | 2.2222222 | 1.8348624 | 1.5037594 |
| **6027** | | | | | | | |
| **RE 6027** | | | | | | | |
| **RPD** | | | | | | | |
| **Average RPD** | 22.77681068 | 6.4193853 | 13.271418 | 12.936064 | 11.976699 | 10.867281 | 23.355723 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Cs** | **Cu** | **Fe** | **Ga** | **Ge** | **Hf** | **Hg** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **ppm** | **ppb** |
| **SI** | **0.01** | **1.41** | **0.02** | **< .1** | **< .1** | **< .02** | **< 5** |
| **LDL** | **0.02** | **0.01** | **0.01** | **0.1** | **0.1** | **0.02** | **5** |
| **SAMPLES** | | | | | | | |
| **221** | 0.77 | 48.59 | 2.76 | 3 | < .1 | 0.3 | 101 |
| **6175 (RE 221)** | 0.45 | 46.91 | 2.85 | 4.4 | < .1 | 0.36 | 107 |
| **RPD** | 52.459016 | 3.5183246 | 3.2085561 | 37.837838 | N/A | 18.181818 | 5.7692308 |
| **242** | 0.9 | 66.05 | 2.68 | 3.4 | < .1 | 0.19 | 134 |
| **6176 (RE 242)** | 0.83 | 63.02 | 2.68 | 3.9 | 0.1 | 0.22 | 136 |
| **RPD** | 8.0924855 | 4.6951267 | 0 | 13.69863 | N/A | 14.634146 | 1.4814815 |
| **263** | 1.53 | 39.15 | 1.71 | 4.3 | < .1 | 0.21 | 32 |
| **RE 263** | 1.62 | 39.8 | 1.7 | 4.4 | < .1 | 0.22 | 35 |
| **RPD** | 5.7142857 | 1.6466118 | 0.5865103 | 2.2988506 | N/A | 4.6511628 | 8.9552239 |
| **320** | 1.4 | 39.13 | 2.33 | 3.8 | < .1 | 0.08 | 98 |
| **6177 (RE 320)** | 1.44 | 38.6 | 2.48 | 4.5 | < .1 | 0.07 | 105 |
| **RPD** | 2.8169014 | 1.3636948 | 6.2370062 | 16.86747 | N/A | 13.333333 | 6.8965517 |
| **356** | 1.65 | 34.6 | 2.42 | 2.4 | < .1 | 0.05 | 84 |
| **6178 (RE 356)** | 1.59 | 33.9 | 2.5 | 2.8 | < .1 | 0.03 | 83 |
| **RPD** | 3.7037037 | 2.0437956 | 3.2520325 | 15.384615 | N/A | 50 | 1.1976048 |
| **4566** | 1.32 | 35.58 | 3.06 | 4 | < .1 | 0.09 | 195 |
| **6179 (RE 4566)** | 1.43 | 35.01 | 3.51 | 4.9 | < .1 | 0.08 | 244 |
| **RPD** | 8 | 1.6149596 | 13.69863 | 20.224719 | N/A | 11.764706 | 22.323462 |
| **4577** | 1.51 | 38.13 | 3.03 | 4.8 | < .1 | 0.16 | 180 |
| **RE 4577** | 1.52 | 37.9 | 3.09 | 4.9 | < .1 | 0.13 | 181 |
| **RPD** | 0.660066 | 0.6050243 | 1.9607843 | 2.0618557 | N/A | 20.689655 | 0.5540166 |
| **6038** | 0.77 | 31.19 | 1.16 | 3.6 | < .1 | 0.31 | 49 |
| **6180 (RE 6038)** | 0.84 | 32.08 | 1.4 | 4.4 | < .1 | 0.19 | 46 |
| **RPD** | 8.6956522 | 2.8133397 | 18.75 | 20 | N/A | 48 | 6.3157895 |
| **6136** | 0.31 | 86.25 | 3.06 | 8.2 | 0.2 | 1.16 | 141 |
| **6181 (RE 6136)** | 0.24 | 44.66 | 2.59 | 6.7 | 0.1 | 0.98 | 113 |
| **RPD** | 25.454545 | 63.539837 | 16.637168 | 20.134228 | 66.666667 | 16.82243 | 22.047244 |
| **6154** | 1.51 | 27.28 | 2.62 | 5.7 | < .1 | 0.27 | 83 |
| **RE 6154** | 1.51 | 28.15 | 2.64 | 5.6 | 0.1 | 0.26 | 67 |
| **RPD** | 0 | 3.1390944 | 0.7604563 | 1.7699115 | N/A | 3.7735849 | 21.333333 |
| **6027** | | | | | | | |
| **RE 6027** | | | | | | | |
| **RPD** | | | | | | | |
| **Average RPD** | 11.559666 | 8.4979808 | 6.5091144 | 15.027812 | N/A | 20.185084 | 9.6873939 |
| | | | | | >25% samples<br><LDL | | |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **In** | **K** | **La** | **Li** | **Mg** | **Mn** | **Mo** |
|---|---|---|---|---|---|---|---|
|  | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **SI** | **< .02** | **< .01** | **< .5** | **0.1** | **< .01** | **< 1** | **0.03** |
| **LDL** | **0.02** | **0.01** | **0.5** | **0.1** | **0.01** | **1** | **0.01** |
| **SAMPLES** |  |  |  |  |  |  |  |
| **221** | 0.04 | 0.16 | 15.6 | 10.6 | 0.29 | 137 | 8.87 |
| **6175 (RE 221)** | 0.04 | 0.26 | 22.8 | 14.5 | 0.48 | 198 | 8.69 |
| **RPD** | 0 | 47.619048 | 37.5 | 31.075697 | 49.350649 | 36.41791 | 2.0501139 |
| **242** | 0.03 | 0.26 | 8.9 | 9.6 | 0.34 | 122 | 5.74 |
| **6176 (RE 242)** | 0.05 | 0.31 | 8.7 | 11.7 | 0.34 | 119 | 5.81 |
| **RPD** | 50 | 17.54386 | 2.2727273 | 19.71831 | 0 | 2.4896266 | 1.2121212 |
| **263** | 0.05 | 0.21 | 27.1 | 24.3 | 0.24 | 265 | 2.35 |
| **RE 263** | 0.06 | 0.21 | 28.1 | 20.1 | 0.24 | 258 | 2.51 |
| **RPD** | 18.181818 | 0 | 3.6231884 | 18.918919 | 0 | 2.6768642 | 6.5843621 |
| **320** | 0.04 | 0.36 | 5.5 | 19.3 | 0.45 | 74 | 9.72 |
| **6177 (RE 320)** | 0.05 | 0.41 | 5.5 | 21.6 | 0.48 | 83 | 10.1 |
| **RPD** | 22.222222 | 12.987013 | 0 | 11.246944 | 6.4516129 | 11.464968 | 3.8345106 |
| **356** | 0.05 | 0.24 | 3.5 | 14.2 | 0.39 | 65 | 7.1 |
| **6178 (RE 356)** | 0.04 | 0.26 | 3.6 | 14.8 | 0.38 | 67 | 6.79 |
| **RPD** | 22.222222 | 8 | 2.8169014 | 4.137931 | 2.5974026 | 3.030303 | 4.4636429 |
| **4566** | 0.04 | 0.26 | 5.8 | 15.2 | 0.51 | 114 | 30.39 |
| **6179 (RE 4566)** | 0.04 | 0.34 | 7.4 | 20.8 | 0.62 | 133 | 30.68 |
| **RPD** | 0 | 26.666667 | 24.242424 | 31.111111 | 19.469027 | 15.384615 | 0.9497298 |
| **4577** | 0.05 | 0.28 | 16.8 | 18.7 | 0.49 | 129 | 24.07 |
| **RE 4577** | 0.05 | 0.29 | 16.9 | 20.7 | 0.5 | 136 | 24.91 |
| **RPD** | 0 | 3.5087719 | 0.5934718 | 10.152284 | 2.020202 | 5.2830189 | 3.4299714 |
| **6038** | 0.05 | 0.19 | 33.4 | 12.2 | 0.24 | 364 | 4.88 |
| **6180 (RE 6038)** | 0.06 | 0.22 | 34.5 | 15.1 | 0.28 | 460 | 4.07 |
| **RPD** | 18.181818 | 14.634146 | 3.2400589 | 21.245421 | 15.384615 | 23.300971 | 18.100559 |
| **6136** | 0.08 | 0.22 | 33 | 30.7 | 0.7 | 265 | 33.18 |
| **6181 (RE 6136)** | 0.12 | 0.11 | 36.4 | 33.9 | 0.82 | 430 | 19.89 |
| **RPD** | 40 | 66.666667 | 9.7982709 | 9.9071207 | 15.789474 | 47.482014 | 50.084794 |
| **6154** | 0.04 | 0.4 | 13.7 | 35.4 | 0.45 | 127 | 1.81 |
| **RE 6154** | 0.05 | 0.42 | 13.7 | 33.8 | 0.45 | 128 | 1.84 |
| **RPD** | 22.222222 | 4.8780488 | 0 | 4.6242775 | 0 | 0.7843137 | 1.6438356 |
| **6027** |  |  |  |  |  |  |  |
| **RE 6027** |  |  |  |  |  |  |  |
| **RPD** |  |  |  |  |  |  |  |
| **Average RPD** | 19.30303 | 20.250422 | 8.4087043 | 16.213802 | 11.106298 | 14.831461 | 9.235364 |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Na**<br>**%** | **Nb**<br>**ppm** | **Ni**<br>**ppm** | **P**<br>**%** | **Pb**<br>**ppm** | **Pd**<br>**ppb** | **Pt**<br>**ppb** |
|---|---|---|---|---|---|---|---|
| **SI** | **0.422** | **< .02** | **0.1** | **< .001** | **0.27** | **< 10** | **< 2** |
| **LDL** | **0.001** | **0.02** | **0.1** | **0.001** | **0.01** | **10** | **2** |
| **SAMPLES** | | | | | | | |
| **221** | 0.549 | 0.13 | 30.2 | 0.09 | 15.95 | < 10 | < 2 |
| **6175 (RE 221)** | 0.714 | 0.13 | 30.4 | 0.137 | 19.1 | < 10 | < 2 |
| **RPD** | 26.128266 | 0 | 0.660066 | 41.409692 | 17.974322 | N/A | N/A |
| **242** | 0.391 | 0.4 | 53.3 | 0.069 | 13.88 | < 10 | 2 |
| **6176 (RE 242)** | 0.383 | 0.4 | 53.4 | 0.061 | 16.15 | < 10 | < 2 |
| **RPD** | 2.0671835 | 0 | 0.1874414 | 12.307692 | 15.118215 | N/A | N/A |
| **263** | 0.665 | 0.03 | 52.8 | 0.017 | 23.71 | < 10 | < 2 |
| **RE 263** | 0.671 | 0.02 | 56.1 | 0.017 | 25.18 | < 10 | < 2 |
| **RPD** | 0.8982036 | 40 | 6.0606061 | 0 | 6.0134997 | N/A | N/A |
| **320** | 0.236 | 0.04 | 56.7 | 0.067 | 15.51 | < 10 | < 2 |
| **6177 (RE 320)** | 0.223 | 0.04 | 59.9 | 0.065 | 16.97 | < 10 | < 2 |
| **RPD** | 5.664488 | 0 | 5.4888508 | 3.030303 | 8.9901478 | N/A | N/A |
| **356** | 0.213 | 0.04 | 45.3 | 0.063 | 16.93 | < 10 | < 2 |
| **6178 (RE 356)** | 0.205 | 0.03 | 43.3 | 0.062 | 17.51 | < 10 | < 2 |
| **RPD** | 3.8277512 | 28.571429 | 4.5146727 | 1.6 | 3.3681765 | N/A | N/A |
| **4566** | 0.198 | 0.06 | 49 | 0.058 | 12 | < 10 | < 2 |
| **6179 (RE 4566)** | 0.193 | 0.09 | 53.8 | 0.068 | 13.14 | < 10 | 3 |
| **RPD** | 2.5575448 | 40 | 9.3385214 | 15.873016 | 9.0692124 | N/A | N/A |
| **4577** | 0.187 | 0.05 | 49.3 | 0.223 | 17.95 | < 10 | 2 |
| **RE 4577** | 0.188 | 0.04 | 50.8 | 0.229 | 18.33 | < 10 | < 2 |
| **RPD** | 0.5333333 | 22.222222 | 2.997003 | 2.6548673 | 2.0948181 | N/A | N/A |
| **6038** | 1.305 | 0.09 | 46.6 | 0.026 | 27.55 | < 10 | < 2 |
| **6180 (RE 6038)** | 1.302 | 0.07 | 46.8 | 0.026 | 35.67 | < 10 | < 2 |
| **RPD** | 0.2301496 | 25 | 0.4282655 | 0 | 25.688073 | N/A | N/A |
| **6136** | 0.422 | 0.49 | 83.3 | 0.074 | 29.84 | < 10 | 4 |
| **6181 (RE 6136)** | 0.582 | 0.2 | 33.4 | 0.034 | 33.5 | < 10 | < 2 |
| **RPD** | 31.87251 | 84.057971 | 85.518423 | 74.074074 | 11.556678 | N/A | N/A |
| **6154** | 0.214 | 0.09 | 33.9 | 0.061 | 20.69 | < 10 | < 2 |
| **RE 6154** | 0.207 | 0.1 | 34 | 0.061 | 21.94 | < 10 | < 2 |
| **RPD** | 3.3254157 | 10.526316 | 0.2945508 | 0 | 5.8644147 | N/A | N/A |
| **6027** | | | | | | | |
| **RE 6027** | | | | | | | |
| **RPD** | | | | | | | |
| **Average RPD** | 7.7104846 | 25.037794 | 11.54884 | 15.094964 | 10.573756 | N/A | N/A |
| | | | | | | > 25%<br>samples<br><LDL | > 25%<br>samples<br><LDL |

***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Rb** | **Re** | **S** | **Sb** | **Sc** | **Se** | **Sn** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **ppb** | **%** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **0.1** | **< 1** | **0.01** | **0.14** | **< .1** | **< .1** | **< .1** |
| **LDL** | **0.1** | **1** | **0.02** | **0.02** | **0.1** | **0.1** | **0.1** |
| **SAMPLES** | | | | | | | |
| **221** | 12.5 | 41 | 2.53 | 0.28 | 2.7 | 2.9 | 0.7 |
| **6175 (RE 221)** | 13.8 | 42 | 2.83 | 0.21 | 4.4 | 3.4 | 0.8 |
| **RPD** | 9.8859316 | 2.4096386 | 11.19403 | 28.571429 | 47.887324 | 15.873016 | 13.333333 |
| **242** | 17.2 | 39 | 2.59 | 1.19 | 2.5 | 4.4 | 0.7 |
| **6176 (RE 242)** | 19.4 | 36 | 2.87 | 1.06 | 2.6 | 4.8 | 0.7 |
| **RPD** | 12.021858 | 8 | 10.25641 | 11.555556 | 3.9215686 | 8.6956522 | 0 |
| **263** | 18.7 | 2 | 0.61 | 0.26 | 4 | 1.1 | 1.6 |
| **RE 263** | 19.4 | 2 | 0.58 | 0.27 | 4 | 1.1 | 1.6 |
| **RPD** | 3.6745407 | 0 | 5.0420168 | 3.7735849 | 0 | 0 | 0 |
| **320** | 21.7 | 22 | 1.44 | 0.95 | 6.6 | 3 | 0.8 |
| **6177 (RE 320)** | 25.7 | 26 | 1.75 | 0.7 | 6.8 | 3.4 | 0.8 |
| **RPD** | 16.877637 | 16.666667 | 19.435737 | 30.30303 | 2.9850746 | 12.5 | 0 |
| **356** | 18.4 | 14 | 1.63 | 0.77 | 4.4 | 2.1 | 0.5 |
| **6178 (RE 356)** | 19.8 | 17 | 1.99 | 0.54 | 4 | 2.3 | 0.5 |
| **RPD** | 7.3298429 | 19.354839 | 19.889503 | 35.114504 | 9.5238095 | 9.0909091 | 0 |
| **4566** | 19.2 | 43 | 1.87 | 0.9 | 6 | 3.2 | 0.5 |
| **6179 (RE 4566)** | 23.9 | 33 | 2.56 | 0.72 | 7 | 3.8 | 0.7 |
| **RPD** | 21.809745 | 26.315789 | 31.151242 | 22.222222 | 15.384615 | 17.142857 | 33.333333 |
| **4577** | 20 | 46 | 1.83 | 0.95 | 5.3 | 2.5 | 0.8 |
| **RE 4577** | 20.8 | 50 | 1.84 | 0.96 | 5.2 | 2.5 | 0.8 |
| **RPD** | 3.9215686 | 8.3333333 | 0.5449591 | 1.0471204 | 1.9047619 | 0 | 0 |
| **6038** | 11.4 | 1 | 0.11 | 0.55 | 2.3 | 1.9 | 3 |
| **6180 (RE 6038)** | 13.5 | 1 | 0.17 | 0.35 | 2.5 | 2.7 | 3.3 |
| **RPD** | 16.86747 | 0 | 42.857143 | 44.444444 | 8.3333333 | 34.782609 | 9.5238095 |
| **6136** | 10.4 | 288 | 3.57 | 6.28 | 3.8 | 43.4 | 2.4 |
| **6181 (RE 6136)** | 5.2 | 116 | 2.96 | 6.13 | 3.3 | 31.4 | 2.4 |
| **RPD** | 66.666667 | 85.148515 | 18.683002 | 2.4174053 | 14.084507 | 32.085561 | 0 |
| **6154** | 27.2 | 10 | 1.62 | 0.36 | 4.7 | 1.2 | 1.1 |
| **RE 6154** | 27.7 | 3 | 1.63 | 0.36 | 4.8 | 1.1 | 1.2 |
| **RPD** | 1.8214936 | 107.69231 | 0.6153846 | 0 | 2.1052632 | 8.6956522 | 8.6956522 |
| **6027** | | | | | | | |
| **RE 6027** | | | | | | | |
| **RPD** | | | | | | | |
| **Average RPD** | 16.087675 | 27.392109 | 15.966943 | 17.94493 | 10.613026 | 13.886626 | 6.4886128 |

### ***Analysis: GROUP 1F1 - 1.00 GM, RPD***

| **ELEMENT** | **Sr** | **Ta** | **Te** | **Th** | **Ti** | **Tl** | **U** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **ppm** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **SI** | **2.1** | **< .05** | **< .02** | **< .1** | **0.001** | **< .02** | **< .01** |
| **LDL** | **0.5** | **0.05** | **0.02** | **0.1** | **0.001** | **0.02** | **0.1** |
| **SAMPLES** | | | | | | | |
| **221** | 211.4 | < .05 | 0.17 | 5.4 | 0.003 | 0.37 | 4.11 |
| **6175 (RE 221)** | 267.4 | < .05 | 0.15 | 6.3 | 0.002 | 0.38 | 5.82 |
| **RPD** | 23.391813 | N/A | 12.5 | 15.384615 | 40 | 2.6666667 | 34.441088 |
| **242** | 144 | < .05 | 0.24 | 4.6 | < .001 | 0.88 | 2.63 |
| **6176 (RE 242)** | 119.5 | < .05 | 0.23 | 4.7 | 0.001 | 0.84 | 2.59 |
| **RPD** | 18.595825 | N/A | 4.2553191 | 2.1505376 | N/A | 4.6511628 | 1.532567 |
| **263** | 110 | < .05 | 0.11 | 12.3 | 0.002 | 0.17 | 4.46 |
| **RE 263** | 111.3 | < .05 | 0.08 | 12.6 | 0.002 | 0.19 | 4.53 |
| **RPD** | 1.1748757 | N/A | 31.578947 | 2.4096386 | 0 | 11.111111 | 1.5572859 |
| **320** | 111.6 | < .05 | 0.1 | 5.4 | < .001 | 0.29 | 2.97 |
| **6177 (RE 320)** | 127.5 | < .05 | 0.08 | 5.4 | 0.001 | 0.27 | 2.99 |
| **RPD** | 13.299875 | N/A | 22.222222 | 0 | N/A | 7.1428571 | 0.6711409 |
| **356** | 68 | < .05 | 0.09 | 5 | 0.007 | 0.22 | 1.59 |
| **6178 (RE 356)** | 64.5 | < .05 | 0.08 | 4.6 | < .001 | 0.15 | 1.42 |
| **RPD** | 5.2830189 | N/A | 11.764706 | 8.3333333 | N/A | 37.837838 | 11.295681 |
| **4566** | 196.3 | < .05 | 0.09 | 4.4 | < .001 | 0.19 | 8.19 |
| **6179 (RE 4566)** | 197.4 | < .05 | 0.07 | 4.5 | 0.001 | 0.25 | 10.69 |
| **RPD** | 0.5588011 | N/A | 25 | 2.247191 | N/A | 27.272727 | 26.483051 |
| **4577** | 129.1 | < .05 | 0.09 | 6.1 | 0.009 | 0.24 | 20.49 |
| **RE 4577** | 131.3 | < .05 | 0.08 | 6.2 | 0.007 | 0.24 | 20.95 |
| **RPD** | 1.6897081 | N/A | 11.764706 | 1.6260163 | 25 | 0 | 2.2200772 |
| **6038** | 187.7 | < .05 | 0.06 | 23.6 | 0.003 | 0.1 | 9.02 |
| **6180 (RE 6038)** | 193.2 | < .05 | 0.05 | 23.6 | 0.001 | 0.08 | 8.9 |
| **RPD** | 2.8878971 | N/A | 18.181818 | 0 | 100 | 22.222222 | 1.3392857 |
| **6136** | 187.2 | < .05 | 0.22 | 11.6 | 0.003 | 4.45 | 8.66 |
| **6181 (RE 6136)** | 245.8 | < .05 | 0.21 | 16.1 | 0.002 | 2.49 | 5.59 |
| **RPD** | 27.066975 | N/A | 4.6511628 | 32.490975 | 40 | 56.48415 | 43.087719 |
| **6154** | 84.6 | < .05 | 0.06 | 9.3 | 0.002 | 0.21 | 2.08 |
| **RE 6154** | 84.2 | < .05 | 0.04 | 9.8 | 0.002 | 0.22 | 2.11 |
| **RPD** | 0.4739336 | N/A | 40 | 5.2356021 | 0 | 4.6511628 | 1.4319809 |
| **6027** | | | | | | | |
| **RE 6027** | | | | | | | |
| **RPD** | | | | | | | |
| **Average RPD** | 9.4422722 | N/A | 18.191888 | 6.9877909 | N/A | 17.40399 | 12.405988 |
| | | >25% samples<br><LDL | | | >25% samples<br><LDL | | |

***Analysis: GROUP 1F1 - 1.00 GM. RPD***

| **ELEMENT** | **V** | **W** | **Y** | **Zn** | **Zr** |
|---|---|---|---|---|---|
| | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **< 2** | **<.1** | **0.02** | **0.5** | **0.3** |
| **LDL** | **2** | **0.1** | **0.01** | **0.1** | **0.1** |
| **SAMPLES** | | | | | |
| **221** | 22 | <.1 | 19.36 | 105.3 | 13 |
| **6175 (RE 221)** | 40 | <.1 | 29.59 | 100.9 | 16.9 |
| **RPD** | 58.064516 | N/A | 41.797753 | 4.2677013 | 26.086957 |
| **242** | 48 | <.1 | 8.5 | 144.9 | 8.7 |
| **6176 (RE 242)** | 55 | <.1 | 8.04 | 130.9 | 10.2 |
| **RPD** | 13.592233 | N/A | 5.5622733 | 10.152284 | 15.873016 |
| **263** | 15 | <.1 | 17.13 | 147.6 | 8.7 |
| **RE 263** | 16 | <.1 | 17.71 | 148 | 8.2 |
| **RPD** | 6.4516129 | N/A | 3.3295063 | 0.270636 | 5.9171598 |
| **320** | 54 | <.1 | 11.68 | 165.3 | 2.6 |
| **6177 (RE 320)** | 64 | <.1 | 12.06 | 203.3 | 2.1 |
| **RPD** | 16.949153 | N/A | 3.2013479 | 20.618557 | 21.276596 |
| **356** | 32 | <.1 | 9.67 | 131.6 | 1.2 |
| **6178 (RE 356)** | 36 | <.1 | 9.46 | 131.6 | 1.2 |
| **RPD** | 11.764706 | N/A | 2.1955044 | 0 | 0 |
| **4566** | 62 | <.1 | 13.32 | 167.4 | 2.8 |
| **6179 (RE 4566)** | 82 | 0.1 | 15.78 | 119.5 | 3.2 |
| **RPD** | 27.777778 | N/A | 16.907216 | 33.391426 | 13.333333 |
| **4577** | 59 | 0.3 | 31.38 | 137.3 | 3.9 |
| **RE 4577** | 59 | 0.3 | 32.32 | 140.5 | 3.9 |
| **RPD** | 0 | 0 | 2.9513344 | 2.3038157 | 0 |
| **6038** | 9 | <.1 | 23.07 | 138.7 | 12.4 |
| **6180 (RE 6038)** | 11 | <.1 | 23.79 | 166.2 | 8.4 |
| **RPD** | 20 | N/A | 3.0729834 | 18.038701 | 38.461538 |
| **6136** | 328 | <.1 | 21.39 | 306 | 47.8 |
| **6181 (RE 6136)** | 192 | <.1 | 12.1 | 199.5 | 39.8 |
| **RPD** | 52.307692 | N/A | 55.479248 | 42.136499 | 18.26484 |
| **6154** | 41 | <.1 | 11.43 | 106.7 | 10.7 |
| **RE 6154** | 41 | <.1 | 11.89 | 115.8 | 11.1 |
| **RPD** | 0 | N/A | 3.9451115 | 8.1797753 | 3.6697248 |
| **6027** | | | | | |
| **RE 6027** | | | | | |
| **RPD** | | | | | |
| **Average RPD** | 20.690769 | N/A | 13.844228 | 13.935939 | 14.288316 |
| | | >25% samples<br><LDL | | | |

***Analysis: GROUP 1EX - 0.25 GM, RPD***

| **ELEMENT** | **Ag** | **Al** | **As** | **Au** | **Ba** | **Be** | **Bi** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **< .1** | **0.89** | **< 1** | **< .1** | **145** | **< 1** | **< .1** |
| **LDL** | **0.1** | **0.01** | **1** | **0.1** | **1** | **1** | **0.1** |
| **SAMPLES** | | | | | | | |
| **221** | 0.4 | 6.34 | 21 | < .1 | 67 | 3 | 0.5 |
| **6175 (RE 221)** | 0.4 | 6.55 | 19 | < .1 | 50 | 2 | 0.4 |
| **RPD** | 0 | 3.2583398 | 10 | N/A | 29.059829 | 40 | 22.222222 |
| **242** | 0.4 | 6.65 | 20 | < .1 | 65 | 5 | 0.3 |
| **6176 (RE 242)** | 0.4 | 6.97 | 24 | < .1 | 39 | 2 | 0.3 |
| **RPD** | 0 | 4.6989721 | 18.181818 | N/A | 50 | 85.714286 | 0 |
| **263** | 0.2 | 8.82 | 15 | < .1 | 449 | 2 | 0.6 |
| **RE 263** | 0.2 | 8.79 | 18 | < .1 | 453 | 2 | 0.6 |
| **RPD** | 0 | 0.3407155 | 18.181818 | N/A | 0.886918 | 0 | 0 |
| **320** | 0.3 | 7.64 | 13 | < .1 | 180 | 2 | 0.2 |
| **6177 (RE 320)** | 0.3 | 7.8 | 13 | < .1 | 135 | 2 | 0.4 |
| **RPD** | 0 | 2.0725389 | 0 | N/A | 28.571429 | 0 | 66.666667 |
| **356** | 0.3 | 8.29 | 12 | < .1 | 201 | 4 | 0.3 |
| **6178 (RE 356)** | 0.3 | 8.31 | 17 | < .1 | 118 | 2 | 0.4 |
| **RPD** | 0 | 0.2409639 | 34.482759 | N/A | 52.037618 | 66.666667 | 28.571429 |
| **4566** | 0.2 | 8.28 | 21 | < .1 | 191 | 1 | 0.2 |
| **6179 (RE 4566)** | 0.3 | 6.92 | 25 | < .1 | 90 | 1 | 0.3 |
| **RPD** | 40 | 17.894737 | 17.391304 | N/A | 71.886121 | 0 | 40 |
| **4577** | 0.2 | 7.49 | 13 | < .1 | 164 | 1 | 0.3 |
| **RE 4577** | 0.3 | 7.19 | 14 | < .1 | 132 | 1 | 0.2 |
| **RPD** | 40 | 4.0871935 | 7.4074074 | N/A | 21.621622 | 0 | 40 |
| **6038** | 0.2 | 7.02 | 6 | < .1 | 383 | 2 | 0.9 |
| **6180 (RE 6038)** | 0.2 | 8.74 | 7 | < .1 | 402 | 1 | 0.9 |
| **RPD** | 0 | 21.827411 | 15.384615 | N/A | 4.8407643 | 66.666667 | 0 |
| **6136** | 1.1 | 8.04 | 14 | < .1 | 72 | 1 | 0.4 |
| **6181 (RE 6136)** | 0.7 | 7.93 | 16 | < .1 | 114 | 1 | 0.3 |
| **RPD** | 44.444444 | 1.377583 | 13.333333 | N/A | 45.16129 | 0 | 28.571429 |
| **6154** | 0.1 | 8.96 | 12 | < .1 | 230 | 3 | 0.4 |
| **RE 6154** | 0.1 | 8.64 | 12 | < .1 | 211 | 1 | 0.4 |
| **RPD** | 0 | 3.6363636 | 0 | N/A | 8.61678 | 100 | 0 |
| **6027** | 0.2 | 6.15 | 15 | < .1 | 193 | 2 | 0.3 |
| **RE 6027** | 0.2 | 6.01 | 14 | < .1 | 176 | 1 | 0.2 |
| **RPD** | 0 | 2.3026316 | 6.8965517 | N/A | 9.2140921 | 66.666667 | 40 |
| **Average RPD** | 11.313131 | 5.6124954 | 12.841782 | N/A | 29.263315 | 38.701299 | 24.184704 |
| | | | | >25% samples<br><LDL | | | |

***Analysis: GROUP 1EX - 0.25 GM, RPD***

| **ELEMENT** | **Ca** | **Cd** | **Ce** | **Co** | **Cr** | **Cu** | **Fe** |
|---|---|---|---|---|---|---|---|
| | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **SI** | **7.19** | **0.2** | **3** | **< 1** | **0.1** | **4.5** | **0.07** |
| **LDL** | **0.01** | **0.1** | **1** | **1** | **0.1** | **0.1** | **0.01** |
| **SAMPLES** | | | | | | | |
| **221** | 4.1 | 0.8 | 62 | 10 | 70.2 | 50.4 | 3.62 |
| **6175 (RE 221)** | 5.14 | 0.9 | 61 | 9 | 61.4 | 46.7 | 3.09 |
| **RPD** | 22.510823 | 11.764706 | 1.6260163 | 10.526316 | 13.37386 | 7.6210093 | 15.797317 |
| **242** | 3.46 | 1.4 | 51 | 15 | 93 | 63 | 3.55 |
| **6176 (RE 242)** | 3.06 | 1.2 | 49 | 17 | 87.1 | 68.2 | 3.39 |
| **RPD** | 12.269939 | 15.384615 | 4 | 12.5 | 6.5519156 | 7.9268293 | 4.610951 |
| **263** | 0.17 | 1.8 | 75 | 16 | 76.2 | 39.9 | 3.45 |
| **RE 263** | 0.18 | 2.2 | 75 | 17 | 80.5 | 41.2 | 3.58 |
| **RPD** | 5.7142857 | 20 | 0 | 6.0606061 | 5.488194 | 3.2059186 | 3.6984353 |
| **320** | 3.71 | 1.3 | 60 | 13 | 115.9 | 37.9 | 3.26 |
| **6177 (RE 320)** | 4.42 | 1.6 | 60 | 14 | 114 | 39.3 | 3.02 |
| **RPD** | 17.466175 | 20.689655 | 0 | 7.4074074 | 1.6528926 | 3.626943 | 7.6433121 |
| **356** | 1.93 | 0.8 | 54 | 12 | 108.3 | 34.5 | 3.17 |
| **6178 (RE 356)** | 1.87 | 0.9 | 62 | 13 | 113.9 | 37.3 | 3.25 |
| **RPD** | 3.1578947 | 11.764706 | 13.793103 | 8 | 5.0405041 | 7.7994429 | 2.4922118 |
| **4566** | 7.92 | 1.2 | 62 | 13 | 88.6 | 35.9 | 3.77 |
| **6179 (RE 4566)** | 8.36 | 0.9 | 60 | 15 | 106 | 36.3 | 4.06 |
| **RPD** | 5.4054054 | 28.571429 | 3.2786885 | 14.285714 | 17.882837 | 1.1080332 | 7.4074074 |
| **4577** | 3.14 | 0.9 | 76 | 13 | 85.5 | 37.4 | 3.7 |
| **RE 4577** | 3.05 | 0.6 | 75 | 14 | 88.4 | 37.9 | 3.55 |
| **RPD** | 2.907916 | 40 | 1.3245033 | 7.4074074 | 3.3352501 | 1.3280212 | 4.137931 |
| **6038** | 0.25 | 2.2 | 54 | 7 | 35.1 | 28.1 | 2.46 |
| **6180 (RE 6038)** | 0.38 | 1.7 | 64 | 8 | 46 | 33.7 | 2.76 |
| **RPD** | 41.269841 | 25.641026 | 16.949153 | 13.333333 | 26.880395 | 18.122977 | 11.494253 |
| **6136** | 1.97 | 15.6 | 84 | 16 | 62.7 | 88.2 | 3.6 |
| **6181 (RE 6136)** | 1.36 | 8.9 | 64 | 7 | 33.3 | 46.8 | 2.79 |
| **RPD** | 36.636637 | 54.693878 | 27.027027 | 78.26087 | 61.25 | 61.333333 | 25.352113 |
| **6154** | 0.28 | 0.3 | 69 | 13 | 119.4 | 29.5 | 3.52 |
| **RE 6154** | 0.27 | 0.1 | 62 | 12 | 117.9 | 27.8 | 3.49 |
| **RPD** | 3.6363636 | 100 | 10.687023 | 8 | 1.2642225 | 5.9336824 | 0.8559201 |
| **6027** | 1.41 | 0.3 | 68 | 10 | 101.6 | 33 | 2.54 |
| **RE 6027** | 1.36 | 0.4 | 68 | 9 | 97.8 | 31.1 | 2.48 |
| **RPD** | 3.6101083 | 28.571429 | 0 | 10.526316 | 3.8114343 | 5.9282371 | 2.3904382 |
| **Average RPD** | 14.053217 | 32.461949 | 7.1532285 | 16.027997 | 13.321046 | 11.266766 | 7.8072991 |

***Analysis: GROUP 1EX - 0.25 GM, RPD***

| **ELEMENT** | **Hf** | **K** | **La** | **Li** | **Mg** | **Mn** | **Mo** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** |
| **SI** | **0.6** | **0.19** | **2** | **1.8** | **0.14** | **17** | **0.4** |
| **LDL** | **0.1** | **0.01** | **0.1** | **0.1** | **0.01** | **1** | **0.1** |
| **SAMPLES** | | | | | | | |
| **221** | 2.4 | 1.5 | 30.1 | 35.8 | 0.94 | 164 | 9.9 |
| **6175 (RE 221)** | 2.5 | 1.33 | 34 | 38.2 | 1.1 | 208 | 8.9 |
| **RPD** | 4.0816327 | 12.014134 | 12.168487 | 6.4864865 | 15.686275 | 23.655914 | 10.638298 |
| **242** | 2.2 | 2.02 | 26.6 | 43.4 | 0.78 | 147 | 5.9 |
| **6176 (RE 242)** | 2.2 | 2.09 | 27.6 | 45 | 0.8 | 142 | 6.2 |
| **RPD** | 0 | 3.406326 | 3.6900369 | 3.6199095 | 2.5316456 | 3.4602076 | 4.9586777 |
| **263** | 4 | 1.66 | 31 | 69.6 | 0.67 | 323 | 2.8 |
| **RE 263** | 3.8 | 1.62 | 29.5 | 73.5 | 0.67 | 327 | 3 |
| **RPD** | 5.1282051 | 2.4390244 | 4.9586777 | 5.4507338 | 0 | 1.2307692 | 6.8965517 |
| **320** | 2.3 | 2.11 | 26.5 | 72.5 | 0.85 | 101 | 10 |
| **6177 (RE 320)** | 2.4 | 2.23 | 33.8 | 75 | 0.87 | 99 | 11 |
| **RPD** | 4.2553191 | 5.5299539 | 24.212272 | 3.3898305 | 2.3255814 | 2 | 9.5238095 |
| **356** | 2 | 2.12 | 28.6 | 77.8 | 0.83 | 75 | 6.7 |
| **6178 (RE 356)** | 2.2 | 2.45 | 32.5 | 92.9 | 0.84 | 86 | 8 |
| **RPD** | 9.5238095 | 14.442013 | 12.765957 | 17.691857 | 1.1976048 | 13.664596 | 17.687075 |
| **4566** | 1.8 | 1.79 | 36 | 60.1 | 0.94 | 111 | 28.9 |
| **6179 (RE 4566)** | 2.1 | 1.87 | 34.6 | 64.9 | 0.94 | 144 | 32 |
| **RPD** | 15.384615 | 4.3715847 | 3.9660057 | 7.68 | 0 | 25.882353 | 10.180624 |
| **4577** | 1.8 | 1.7 | 42.1 | 65.5 | 0.84 | 158 | 22.5 |
| **RE 4577** | 1.8 | 1.74 | 43.2 | 64.5 | 0.8 | 134 | 21.7 |
| **RPD** | 0 | 2.3255814 | 2.5791325 | 1.5384615 | 4.8780488 | 16.438356 | 3.6199095 |
| **6038** | 3.9 | 0.87 | 26 | 33.8 | 0.98 | 305 | 5 |
| **6180 (RE 6038)** | 4.4 | 1.01 | 32.8 | 36.6 | 1.14 | 489 | 5.4 |
| **RPD** | 12.048193 | 14.893617 | 23.129252 | 7.9545455 | 15.09434 | 46.347607 | 7.6923077 |
| **6136** | 6.1 | 1.33 | 44.7 | 91.8 | 1.76 | 286 | 40.1 |
| **6181 (RE 6136)** | 8.4 | 0.68 | 30.7 | 105 | 2.32 | 452 | 24.5 |
| **RPD** | 31.724138 | 64.676617 | 37.135279 | 13.414634 | 27.45098 | 44.98645 | 48.297214 |
| **6154** | 3.3 | 2.53 | 37.9 | 100.2 | 0.92 | 156 | 2.2 |
| **RE 6154** | 3.1 | 2.5 | 33.4 | 100 | 0.91 | 151 | 2 |
| **RPD** | 6.25 | 1.1928429 | 12.622721 | 0.1998002 | 1.0928962 | 3.257329 | 9.5238095 |
| **6027** | 2.6 | 1.91 | 38.7 | 45.5 | 0.57 | 117 | 1.8 |
| **RE 6027** | 2.7 | 1.91 | 37.8 | 44.2 | 0.56 | 120 | 1.8 |
| **RPD** | 3.7735849 | 0 | 2.3529412 | 2.8985507 | 1.7699115 | 2.5316456 | 0 |
| **Average RPD** | 8.3790452 | 11.390154 | 12.68916 | 6.3931645 | 6.5479348 | 16.677748 | 11.728934 |

***Analysis: GROUP 1EX - 0.25 GM, RPD***

| **ELEMENT** | **Na** | **Nb** | **Ni** | **P** | **Pb** | **Rb** | **S** |
|---|---|---|---|---|---|---|---|
| | **%** | **ppm** | **ppm** | **%** | **ppm** | **ppm** | **%** |
| **SI** | **9.652** | **0.2** | **< .1** | **0.008** | **11.4** | **2.8** | **0.2** |
| **LDL** | **0.001** | **0.1** | **0.1** | **0.001** | **0.1** | **0.1** | **0.1** |
| **SAMPLES** | | | | | | | |
| **221** | 0.775 | 8.4 | 30.7 | 0.096 | 18.9 | 92.1 | 3.1 |
| **6175 (RE 221)** | 0.875 | 7.4 | 28.3 | 0.147 | 16.7 | 71.5 | 2.8 |
| **RPD** | 12.121212 | 12.658228 | 8.1355932 | 41.975309 | 12.359551 | 25.183374 | 10.169492 |
| **242** | 0.54 | 10.3 | 53.8 | 0.071 | 15.2 | 115.6 | 2.9 |
| **6176 (RE 242)** | 0.587 | 11 | 54 | 0.074 | 17.7 | 110.5 | 2.8 |
| **RPD** | 8.3407276 | 6.57277 | 0.3710575 | 4.137931 | 15.197568 | 4.5112782 | 3.5087719 |
| **263** | 0.868 | 12.6 | 61.9 | 0.024 | 28.9 | 90.5 | 0.6 |
| **RE 263** | 0.87 | 13.4 | 66.5 | 0.026 | 32.3 | 90.9 | 0.6 |
| **RPD** | 0.2301496 | 6.1538462 | 7.165109 | 8 | 11.111111 | 0.4410143 | 0 |
| **320** | 0.451 | 11.4 | 64 | 0.079 | 18.5 | 106.8 | 1.6 |
| **6177 (RE 320)** | 0.495 | 11.9 | 58.3 | 0.083 | 18.8 | 121.7 | 1.8 |
| **RPD** | 9.3023256 | 4.2918455 | 9.321341 | 4.9382716 | 1.6085791 | 13.041575 | 11.764706 |
| **356** | 0.423 | 13.9 | 48.8 | 0.076 | 19.1 | 101.8 | 1.9 |
| **6178 (RE 356)** | 0.46 | 14.2 | 50.6 | 0.087 | 20.8 | 123.3 | 2 |
| **RPD** | 8.380521 | 2.1352313 | 3.6217304 | 13.496933 | 8.5213033 | 19.102621 | 5.1282051 |
| **4566** | 0.364 | 9.8 | 50.6 | 0.071 | 13.6 | 109.6 | 2.5 |
| **6179 (RE 4566)** | 0.374 | 10.5 | 54 | 0.084 | 15.3 | 109.5 | 2.7 |
| **RPD** | 2.7100271 | 6.8965517 | 6.500956 | 16.774194 | 11.764706 | 0.0912825 | 7.6923077 |
| **4577** | 0.461 | 10.6 | 57.2 | 0.217 | 18.5 | 96.7 | 2.4 |
| **RE 4577** | 0.455 | 10 | 53.5 | 0.216 | 17.6 | 95.3 | 2.4 |
| **RPD** | 1.3100437 | 5.8252427 | 6.6847335 | 0.4618938 | 4.9861496 | 1.4583333 | 0 |
| **6038** | 1.396 | 19.5 | 46.1 | 0.027 | 27.6 | 33.3 | 0.1 |
| **6180 (RE 6038)** | 1.523 | 20.1 | 43.3 | 0.032 | 34.6 | 45.1 | 0.1 |
| **RPD** | 8.7016101 | 3.030303 | 6.2639821 | 16.949153 | 22.508039 | 30.102041 | 0 |
| **6136** | 0.625 | 9.1 | 78.6 | 0.081 | 29.2 | 65.2 | 3.3 |
| **6181 (RE 6136)** | 0.746 | 7 | 33.5 | 0.04 | 34 | 15.1 | 3.1 |
| **RPD** | 17.651349 | 26.086957 | 80.463872 | 67.768595 | 15.189873 | 124.78207 | 6.25 |
| **6154** | 0.494 | 13.8 | 39.1 | 0.08 | 23.5 | 134.7 | 1.5 |
| **RE 6154** | 0.484 | 12.4 | 41.2 | 0.079 | 23.6 | 129.8 | 1.5 |
| **RPD** | 2.0449898 | 10.687023 | 5.2303861 | 1.2578616 | 0.4246285 | 3.705104 | 0 |
| **6027** | 0.575 | 10 | 33.1 | 0.101 | 15.6 | 94.4 | 1.2 |
| **RE 6027** | 0.603 | 10.1 | 33.3 | 0.107 | 16.2 | 91.1 | 1.2 |
| **RPD** | 4.75382 | 0.9950249 | 0.6024096 | 5.7692308 | 3.7735849 | 3.5579515 | 0 |
| **Average RPD** | 6.8678887 | 7.7575475 | 12.214652 | 16.50267 | 9.7677357 | 20.543331 | 4.0466802 |

***Analysis: GROUP 1EX - 0.25 GM, RPD***

| **ELEMENT** | **Sb** | **Sc** | **Sn** | **Sr** | **Ta** | **Th** | **Ti** |
|---|---|---|---|---|---|---|---|
|  | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **%** |
| **SI** | **0.9** | **< 1** | **2.4** | **167** | **<.1** | **0.3** | **0.032** |
| **LDL** | **0.1** | **1** | **0.1** | **1** | **0.1** | **0.1** | **0.01** |
| **SAMPLES** |  |  |  |  |  |  |  |
| **221** | 0.6 | 9 | 1.6 | 283 | 0.5 | 8.6 | 0.292 |
| **6175 (RE 221)** | 0.7 | 10 | 1.5 | 321 | 0.5 | 8.7 | 0.265 |
| **RPD** | 15.384615 | 10.526316 | 6.4516129 | 12.582781 | 0 | 1.1560694 | 9.6947935 |
| **242** | 2.5 | 10 | 1.9 | 207 | 0.6 | 7.9 | 0.321 |
| **6176 (RE 242)** | 2.7 | 10 | 2 | 185 | 0.6 | 8 | 0.32 |
| **RPD** | 7.6923077 | 0 | 5.1282051 | 11.22449 | 0 | 1.2578616 | 0.3120125 |
| **263** | 0.7 | 12 | 3 | 156 | 1 | 14.2 | 0.421 |
| **RE 263** | 0.8 | 12 | 3 | 157 | 1.1 | 15 | 0.417 |
| **RPD** | 13.333333 | 0 | 0 | 0.6389776 | 9.5238095 | 5.4794521 | 0.9546539 |
| **320** | 1.9 | 13 | 2.3 | 204 | 0.8 | 9.1 | 0.392 |
| **6177 (RE 320)** | 2.1 | 14 | 2 | 230 | 0.8 | 9.9 | 0.393 |
| **RPD** | 10 | 7.4074074 | 13.953488 | 11.981567 | 0 | 8.4210526 | 0.2547771 |
| **356** | 1.3 | 10 | 1.9 | 177 | 0.9 | 8.3 | 0.41 |
| **6178 (RE 356)** | 1.5 | 12 | 2.4 | 173 | 0.9 | 10 | 0.439 |
| **RPD** | 14.285714 | 18.181818 | 23.255814 | 2.2857143 | 0 | 18.579235 | 6.8315665 |
| **4566** | 1.6 | 12 | 1.8 | 330 | 0.7 | 8.3 | 0.365 |
| **6179 (RE 4566)** | 1.8 | 13 | 2.1 | 299 | 0.7 | 8.6 | 0.345 |
| **RPD** | 11.764706 | 8 | 15.384615 | 9.8569157 | 0 | 3.5502959 | 5.6338028 |
| **4577** | 1.7 | 11 | 2 | 225 | 0.7 | 9.1 | 0.341 |
| **RE 4577** | 1.5 | 10 | 1.6 | 235 | 0.7 | 8.9 | 0.345 |
| **RPD** | 12.5 | 9.5238095 | 22.222222 | 4.3478261 | 0 | 2.2222222 | 1.1661808 |
| **6038** | 1.1 | 6 | 5.6 | 221 | 2.1 | 16.9 | 0.204 |
| **6180 (RE 6038)** | 1.2 | 8 | 5.5 | 235 | 2 | 22 | 0.251 |
| **RPD** | 8.6956522 | 28.571429 | 1.8018018 | 6.1403509 | 4.8780488 | 26.22108 | 20.659341 |
| **6136** | 18.8 | 11 | 3 | 247 | 0.9 | 14 | 0.267 |
| **6181 (RE 6136)** | 18.1 | 9 | 2.6 | 274 | 0.8 | 14.4 | 0.213 |
| **RPD** | 3.7940379 | 20 | 14.285714 | 10.364683 | 11.764706 | 2.8169014 | 22.5 |
| **6154** | 1.1 | 14 | 2.8 | 169 | 0.9 | 13.2 | 0.464 |
| **RE 6154** | 0.9 | 14 | 2.8 | 161 | 0.9 | 12.6 | 0.463 |
| **RPD** | 20 | 0 | 0 | 4.8484848 | 0 | 4.6511628 | 0.2157497 |
| **6027** | 1 | 10 | 2.1 | 149 | 0.7 | 10.6 | 0.372 |
| **RE 6027** | 0.9 | 10 | 2.6 | 144 | 0.7 | 10.1 | 0.358 |
| **RPD** | 10.526316 | 0 | 21.276596 | 3.4129693 | 0 | 4.8309179 | 3.8356164 |
| **Average RPD** | 11.634244 | 9.291889 | 11.250915 | 7.0622509 | 2.3787786 | 7.19875 | 6.5507722 |

***Analysis: GROUP 1EX - 0.25 GM, RPD***

| **ELEMENT** | **U** | **V** | **W** | **Y** | **Zn** | **Zr** |
|---|---|---|---|---|---|---|
| | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **0.3** | **< 1** | **0.2** | **2.8** | **15** | **26.3** |
| **LDL** | **0.1** | **1** | **0.1** | **0.1** | **1** | **0.1** |
| **SAMPLES** | | | | | | |
| **221** | 5.8 | 172 | 1.3 | 24.8 | 119 | 71.1 |
| **6175 (RE 221)** | 6.4 | 170 | 1 | 33.5 | 117 | 71 |
| **RPD** | 9.8360656 | 1.1695906 | 26.086957 | 29.845626 | 1.6949153 | 0.140746 |
| **242** | 4.3 | 235 | 1.2 | 13.2 | 167 | 65.6 |
| **6176 (RE 242)** | 4.1 | 252 | 1.2 | 13.5 | 158 | 68.3 |
| **RPD** | 4.7619048 | 6.9815195 | 0 | 2.247191 | 5.5384615 | 4.0328603 |
| **263** | 5.8 | 129 | 1.9 | 22 | 163 | 105.2 |
| **RE 263** | 5.9 | 132 | 2.4 | 22.9 | 170 | 108.1 |
| **RPD** | 1.7094017 | 2.2988506 | 23.255814 | 4.0089087 | 4.2042042 | 2.7191749 |
| **320** | 5.2 | 282 | 1 | 18 | 184 | 60.7 |
| **6177 (RE 320)** | 5.6 | 289 | 1.4 | 19.1 | 240 | 64.1 |
| **RPD** | 7.4074074 | 2.4518389 | 33.333333 | 5.9299191 | 26.415094 | 5.4487179 |
| **356** | 4 | 265 | 1.1 | 13.2 | 154 | 62.7 |
| **6178 (RE 356)** | 4.2 | 297 | 1.1 | 17.1 | 167 | 67.1 |
| **RPD** | 4.8780488 | 11.3879 | 0 | 25.742574 | 8.0996885 | 6.779661 |
| **4566** | 10.2 | 248 | 1 | 17.7 | 175 | 61.6 |
| **6179 (RE 4566)** | 12.9 | 263 | 1.1 | 22.2 | 143 | 63.8 |
| **RPD** | 23.376623 | 5.8708415 | 9.5238095 | 22.556391 | 20.125786 | 3.5087719 |
| **4577** | 19.7 | 215 | 1.6 | 30.2 | 142 | 61.3 |
| **RE 4577** | 19.4 | 208 | 1.2 | 31.6 | 144 | 61 |
| **RPD** | 1.5345269 | 3.3096927 | 28.571429 | 4.5307443 | 1.3986014 | 0.4905969 |
| **6038** | 8.5 | 70 | 1.3 | 18.9 | 141 | 96.3 |
| **6180 (RE 6038)** | 9.4 | 86 | 1.7 | 25.6 | 168 | 105.1 |
| **RPD** | 10.055866 | 20.512821 | 26.666667 | 30.11236 | 17.475728 | 8.7388282 |
| **6136** | 9.9 | 865 | 0.8 | 27.4 | 347 | 149.3 |
| **6181 (RE 6136)** | 6.2 | 565 | 0.6 | 13.1 | 222 | 175.3 |
| **RPD** | 45.962733 | 41.958042 | 28.571429 | 70.617284 | 43.936731 | 16.019717 |
| **6154** | 4.1 | 220 | 1.7 | 18.5 | 133 | 94.2 |
| **RE 6154** | 4.2 | 219 | 1.5 | 18.2 | 134 | 92.2 |
| **RPD** | 2.4096386 | 0.4555809 | 12.5 | 1.6348774 | 0.7490637 | 2.1459227 |
| **6027** | 4.6 | 301 | 1.4 | 29.9 | 113 | 79.4 |
| **RE 6027** | 4.5 | 282 | 1.4 | 30.7 | 111 | 84.9 |
| **RPD** | 2.1978022 | 6.5180103 | 0 | 2.640264 | 1.7857143 | 6.69507 |
| **Average RPD** | 10.375456 | 9.3558807 | 17.137222 | 18.169649 | 11.947635 | 5.1563697 |

***Analysis: GROUP 4B - REE - 0.200 GM, RPD***

| **ELEMENT** | **Ce** | **Co** | **Cs** | **Dy** | **Er** | **Eu** | **Ga** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **3.4** | **< .5** | **< .1** | **0.33** | **0.24** | **0.24** | **1.5** |
| **LDL** | **0.5** | **0.5** | **0.1** | **0.05** | **0.05** | **0.05** | **0.5** |
| **SAMPLES** | | | | | | | |
| **221** | 63.6 | 9.2 | 5.8 | 4.65 | 2.62 | 1.21 | 14.9 |
| **6175 (RE 221)** | 69.5 | 8.8 | 5 | 6.4 | 3.42 | 1.43 | 14.2 |
| **RPD** | 8.8655147 | 4.4444444 | 14.814815 | 31.674208 | 26.490066 | 16.666667 | 4.8109966 |
| **242** | 59.7 | 15.3 | 8.4 | 3.26 | 1.76 | 1.03 | 17.1 |
| **6176 (RE 242)** | 57.6 | 11.8 | 8.4 | 2.98 | 1.89 | 0.81 | 17.5 |
| **RPD** | 3.5805627 | 25.830258 | 0 | 8.974359 | 7.1232877 | 23.913043 | 2.3121387 |
| **263** | 97.7 | 16.3 | 7.6 | 6.33 | 3.53 | 1.63 | 23.4 |
| **RE 263** | 96 | 15.5 | 7.9 | 6.32 | 3.56 | 1.61 | 21.6 |
| **RPD** | 1.7552917 | 5.0314465 | 3.8709677 | 0.1581028 | 0.8462623 | 1.2345679 | 8 |
| **320** | 76 | 14.3 | 9 | 4.56 | 2.59 | 1.43 | 19.8 |
| **6177 (RE 320)** | 68 | 12.1 | 9 | 4.41 | 2.58 | 1.11 | 18.9 |
| **RPD** | 11.111111 | 16.666667 | 0 | 3.3444816 | 0.3868472 | 25.19685 | 4.6511628 |
| **356** | 73 | 12.4 | 10.6 | 4.4 | 2.41 | 1.21 | 21.2 |
| **6178 (RE 356)** | 72.1 | 12.3 | 9.6 | 4.23 | 2.51 | 1.07 | 20.3 |
| **RPD** | 1.2405238 | 0.8097166 | 9.9009901 | 3.9397451 | 4.0650407 | 12.280702 | 4.3373494 |
| **4566** | 67.1 | 12.5 | 7.5 | 4.05 | 2.3 | 1.03 | 17.7 |
| **6179 (RE 4566)** | 61.1 | 12.9 | 7.6 | 4.49 | 2.62 | 1.09 | 17.1 |
| **RPD** | 9.3603744 | 3.1496063 | 1.3245033 | 10.30445 | 13.00813 | 5.6603774 | 3.4482759 |
| **4577** | 86.6 | 13 | 7.5 | 7.62 | 3.94 | 1.88 | 18.4 |
| **RE 4577** | 87.9 | 12.4 | 7.3 | 7.68 | 3.98 | 1.87 | 17.3 |
| **RPD** | 1.4899713 | 4.7244094 | 2.7027027 | 0.7843137 | 1.010101 | 0.5333333 | 6.162465 |
| **6038** | 83.2 | 8.2 | 4 | 6.57 | 3.45 | 1.1 | 23 |
| **6180 (RE 6038)** | 81.5 | 8 | 4 | 6.39 | 3.39 | 1.1 | 22.7 |
| **RPD** | 2.0643594 | 2.4691358 | 0 | 2.7777778 | 1.754386 | 0 | 1.3129103 |
| **6136** | 85.9 | 12.9 | 4.3 | 5.96 | 2.9 | 1.05 | 21.4 |
| **6181 (RE 6136)** | 85.9 | 6.9 | 1.7 | 3.93 | 1.87 | 0.72 | 20.4 |
| **RPD** | 0 | 60.606061 | 86.666667 | 41.051567 | 43.186583 | 37.288136 | 4.784689 |
| **6154** | 84.4 | 10.9 | 9.4 | 4.55 | 2.73 | 1.17 | 21.5 |
| **RE 6154** | 81.6 | 10.9 | 9 | 4.33 | 2.48 | 1.17 | 20.4 |
| **RPD** | 3.373494 | 0 | 4.3478261 | 4.954955 | 9.596929 | 0 | 5.2505967 |
| **6027** | 82.3 | 9 | 6.9 | 6.43 | 3.45 | 1.39 | 15.2 |
| **RE 6027** | 84.3 | 9.9 | 7 | 6.72 | 3.57 | 1.55 | 15.5 |
| **RPD** | 2.4009604 | 9.5238095 | 1.4388489 | 4.4106464 | 3.4188034 | 10.884354 | 1.9543974 |
| **Average RPD** | 4.1129239 | 12.114141 | 11.369756 | 10.215873 | 10.080585 | 12.15073 | 4.2749983 |

***Analysis: GROUP 4B - REE - 0.200 GM, RPD***

| **ELEMENT** | **Gd** | **Hf** | **Ho** | **La** | **Lu** | **Nb** | **Nd** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **0.55** | **2.4** | **0.09** | **1.8** | **0.04** | **< .5** | **2** |
| **LDL** | **0.05** | **0.5** | **0.05** | **0.5** | **0.01** | **0.5** | **0.4** |
| **SAMPLES** | | | | | | | |
| **221** | 5.23 | 3.5 | 0.98 | 33 | 0.37 | 11.5 | 30.3 |
| **6175 (RE 221)** | 7.06 | 3.7 | 1.14 | 35.1 | 0.44 | 10.1 | 34.1 |
| **RPD** | 29.780309 | 5.5555556 | 15.09434 | 6.1674009 | 17.283951 | 12.962963 | 11.801242 |
| **242** | 3.39 | 2.8 | 0.6 | 31 | 0.29 | 15.3 | 27.3 |
| **6176 (RE 242)** | 3.61 | 3.1 | 0.59 | 31.3 | 0.29 | 14.9 | 24.5 |
| **RPD** | 6.2857143 | 10.169492 | 1.6806723 | 0.9630819 | 0 | 2.6490066 | 10.810811 |
| **263** | 6.94 | 5.8 | 1.31 | 44.6 | 0.48 | 18 | 43.5 |
| **RE 263** | 7.14 | 6.1 | 1.29 | 44.3 | 0.47 | 18.1 | 42.3 |
| **RPD** | 2.8409091 | 5.0420168 | 1.5384615 | 0.6749156 | 2.1052632 | 0.5540166 | 2.7972028 |
| **320** | 4.85 | 3.7 | 0.97 | 37.7 | 0.38 | 16.8 | 36.8 |
| **6177 (RE 320)** | 4.91 | 3.7 | 0.82 | 36.1 | 0.39 | 15.8 | 30.8 |
| **RPD** | 1.2295082 | 0 | 16.759777 | 4.3360434 | 2.5974026 | 6.1349693 | 17.751479 |
| **356** | 4.73 | 3.9 | 0.92 | 39.4 | 0.4 | 18.4 | 34.1 |
| **6178 (RE 356)** | 4.78 | 4.2 | 0.8 | 38.1 | 0.4 | 17.4 | 32.6 |
| **RPD** | 1.0515247 | 7.4074074 | 13.953488 | 3.3548387 | 0 | 5.5865922 | 4.4977511 |
| **4566** | 4.49 | 2.6 | 0.81 | 31.5 | 0.36 | 12.9 | 27.9 |
| **6179 (RE 4566)** | 5.04 | 2.9 | 0.89 | 31.7 | 0.36 | 12.8 | 27.8 |
| **RPD** | 11.542497 | 10.909091 | 9.4117647 | 0.6329114 | 0 | 0.7782101 | 0.3590664 |
| **4577** | 7.81 | 4.4 | 1.43 | 41.1 | 0.47 | 14.2 | 40.6 |
| **RE 4577** | 8.65 | 4.5 | 1.54 | 41.5 | 0.48 | 14.5 | 43.4 |
| **RPD** | 10.206561 | 2.247191 | 7.4074074 | 0.968523 | 2.1052632 | 2.0905923 | 6.6666667 |
| **6038** | 6.42 | 5.3 | 1.24 | 39.1 | 0.52 | 23.3 | 36.7 |
| **6180 (RE 6038)** | 6.42 | 5.2 | 1.18 | 39.3 | 0.47 | 23.9 | 37.6 |
| **RPD** | 0 | 1.9047619 | 4.9586777 | 0.5102041 | 10.10101 | 2.5423729 | 2.422611 |
| **6136** | 6.92 | 7.2 | 1.04 | 41.3 | 0.43 | 11.4 | 43.9 |
| **6181 (RE 6136)** | 5.47 | 9.3 | 0.66 | 38.2 | 0.23 | 8.5 | 38.8 |
| **RPD** | 23.405973 | 25.454545 | 44.705882 | 7.7987421 | 60.606061 | 29.145729 | 12.333736 |
| **6154** | 5.54 | 4.8 | 0.85 | 41.9 | 0.4 | 17.5 | 35.1 |
| **RE 6154** | 5.17 | 4.4 | 0.81 | 39.5 | 0.37 | 16.6 | 35.3 |
| **RPD** | 6.9094304 | 8.6956522 | 4.8192771 | 5.8968059 | 7.7922078 | 5.2785924 | 0.5681818 |
| **6027** | 6.85 | 5.8 | 1.29 | 39.2 | 0.42 | 15.5 | 37.1 |
| **RE 6027** | 7.15 | 5.2 | 1.29 | 38.7 | 0.45 | 14.4 | 38.7 |
| **RPD** | 4.2857143 | 10.909091 | 0 | 1.283697 | 6.8965517 | 7.3578595 | 4.2216359 |
| **Average RPD** | 8.8671038 | 8.0268003 | 10.939068 | 2.9624695 | 9.9534282 | 6.8255367 | 6.7482168 |

***Analysis: GROUP 4B - REE - 0.200 GM, RPD***

| **ELEMENT** | **Pr** | **Sn** | **Rb** | **Sm** | **Sr** | **Ta** | **Tb** |
|---|---|---|---|---|---|---|---|
| | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| **SI** | **0.44** | **4** | **2.8** | **0.4** | **167.8** | **<.1** | **0.09** |
| **LDL** | **0.02** | **1** | **0.5** | **0.1** | **0.5** | **0.1** | **0.01** |
| **SAMPLES** | | | | | | | |
| **221** | 7.49 | < 1 | 91.5 | 5.2 | 298.5 | 0.8 | 0.85 |
| **6175 (RE 221)** | 8.61 | < 1 | 77.9 | 7.1 | 362 | 0.8 | 1.11 |
| **RPD** | 13.913043 | N/A | 16.056671 | 30.894309 | 19.227858 | 0 | 26.530612 |
| **242** | 7.09 | < 1 | 123.3 | 4.4 | 221.1 | 0.7 | 0.62 |
| **6176 (RE 242)** | 6.8 | < 1 | 126 | 4.3 | 209.4 | 0.9 | 0.57 |
| **RPD** | 4.1756659 | N/A | 2.166065 | 2.2988506 | 5.4355401 | 25 | 8.4033613 |
| **263** | 11.28 | 3 | 104.3 | 8 | 162.9 | 1.2 | 1.22 |
| **RE 263** | 11.25 | 3 | 99.1 | 8 | 160.2 | 1.2 | 1.16 |
| **RPD** | 0.2663116 | 0 | 5.1130777 | 0 | 1.6713092 | 0 | 5.0420168 |
| **320** | 9.15 | 1 | 138.2 | 6.3 | 227.4 | 0.9 | 0.86 |
| **6177 (RE 320)** | 8.18 | 2 | 138 | 5.9 | 239.1 | 1 | 0.74 |
| **RPD** | 11.19446 | 66.666667 | 0.1448226 | 6.557377 | 5.0160772 | 10.526316 | 15 |
| **356** | 8.7 | 2 | 141.9 | 6.1 | 179.9 | 1.2 | 0.7 |
| **6178 (RE 356)** | 8.57 | 1 | 141.8 | 6 | 177.2 | 1.1 | 0.71 |
| **RPD** | 1.5055009 | 66.666667 | 0.070497 | 1.6528926 | 1.5121815 | 8.6956522 | 1.4184397 |
| **4566** | 7.71 | < 1 | 113.2 | 5.8 | 306.1 | 0.7 | 0.7 |
| **6179 (RE 4566)** | 7.44 | 1 | 111.2 | 5.6 | 293 | 0.8 | 0.75 |
| **RPD** | 3.5643564 | N/A | 1.7825312 | 3.5087719 | 4.3732265 | 13.333333 | 6.8965517 |
| **4577** | 10.65 | < 1 | 110.3 | 9 | 227.6 | 0.9 | 1.34 |
| **RE 4577** | 10.57 | < 1 | 108.4 | 8.9 | 227.1 | 0.9 | 1.3 |
| **RPD** | 0.7540057 | N/A | 1.73754 | 1.1173184 | 0.2199252 | 0 | 3.030303 |
| **6038** | 9.79 | 4 | 56.7 | 7.9 | 251 | 2.5 | 1.08 |
| **6180 (RE 6038)** | 9.34 | 5 | 55.1 | 7.9 | 244.2 | 2.1 | 1.06 |
| **RPD** | 4.7046524 | 22.222222 | 2.862254 | 0 | 2.7463651 | 17.391304 | 1.8691589 |
| **6136** | 10.57 | 49 | 62.8 | 8.4 | 245.6 | 1 | 1.11 |
| **6181 (RE 6136)** | 10.38 | 2 | 29.2 | 7.7 | 278.1 | 0.9 | 0.77 |
| **RPD** | 1.8138425 | 184.31373 | 73.043478 | 8.6956522 | 12.411686 | 10.526316 | 36.170213 |
| **6154** | 9.48 | 2 | 138.8 | 6.3 | 173.8 | 1.1 | 0.82 |
| **RE 6154** | 9.28 | < 1 | 138.9 | 6.3 | 170.1 | 1.1 | 0.73 |
| **RPD** | 2.1321962 | N/A | 0.0720202 | 0 | 2.1517883 | 0 | 11.612903 |
| **6027** | 10.46 | 1 | 108.9 | 7.9 | 175.8 | 0.9 | 1.14 |
| **RE 6027** | 10.29 | 1 | 107 | 8 | 172.4 | 1 | 1.21 |
| **RPD** | 1.6385542 | 0 | 1.7600741 | 1.2578616 | 1.9529006 | 10.526316 | 5.9574468 |
| **Average RPD** | 4.1511445 | N/A | 9.5280937 | 5.0893667 | 5.1562598 | 8.7272034 | 11.084637 |
| | | Over 25%<br>samples <LDL | | | | | |

2

***Analysis: GROUP 4B - REE - 0.200 GM, RPD***

| **ELEMENT** | **Th ppm** | **Tm ppm** | **U ppm** | **V ppm** | **W ppm** | **Y ppm** | **Yb ppm** |
|---|---|---|---|---|---|---|---|
| **SI** | **0.4** | **< .05** | **0.3** | **< 5** | **0.1** | **2.9** | **0.27** |
| **LDL** | **0.1** | **0.05** | **0.1** | **5** | **0.1** | **0.1** | **0.05** |
| **SAMPLES** | | | | | | | |
| **221** | 9 | 0.42 | 6.4 | 175 | 1.3 | 32 | 2.92 |
| **6175 (RE 221)** | 9 | 0.44 | 7.7 | 164 | 1 | 40.4 | 2.96 |
| **RPD** | 0 | 4.6511628 | 18.439716 | 6.4896755 | 26.086957 | 23.20442 | 1.3605442 |
| **242** | 10.2 | 0.3 | 4.9 | 244 | 1.4 | 19.4 | 2 |
| **6176 (RE 242)** | 10.1 | 0.27 | 4.5 | 244 | 1.3 | 18.7 | 2.02 |
| **RPD** | 0.9852217 | 10.526316 | 8.5106383 | 0 | 7.4074074 | 3.6745407 | 0.9950249 |
| **263** | 16.5 | 0.58 | 6.3 | 121 | 2.6 | 36.3 | 3.41 |
| **RE 263** | 17.7 | 0.55 | 6.6 | 116 | 2.1 | 35 | 3.48 |
| **RPD** | 7.0175439 | 5.3097345 | 4.6511628 | 4.2194093 | 21.276596 | 3.6465638 | 2.0319303 |
| **320** | 10.7 | 0.44 | 6.9 | 284 | 1.7 | 27 | 2.85 |
| **6177 (RE 320)** | 12.3 | 0.36 | 6.9 | 290 | 1.4 | 26.5 | 2.64 |
| **RPD** | 13.913043 | 20 | 0 | 2.0905923 | 19.354839 | 1.8691589 | 7.6502732 |
| **356** | 12.1 | 0.38 | 6 | 292 | 1.5 | 27.2 | 2.62 |
| **6178 (RE 356)** | 11.3 | 0.39 | 5.2 | 282 | 1.7 | 26.2 | 2.58 |
| **RPD** | 6.8376068 | 2.5974026 | 14.285714 | 3.4843206 | 12.5 | 3.7453184 | 1.5384615 |
| **4566** | 7.9 | 0.38 | 11.4 | 248 | 1.3 | 26.5 | 2.44 |
| **6179 (RE 4566)** | 8.5 | 0.36 | 13.9 | 243 | 1.2 | 28.3 | 2.39 |
| **RPD** | 7.3170732 | 5.4054054 | 19.762846 | 2.0366599 | 8 | 6.5693431 | 2.0703934 |
| **4577** | 10.5 | 0.57 | 23.7 | 218 | 1.2 | 46.8 | 3.48 |
| **RE 4577** | 12.4 | 0.57 | 22.9 | 214 | 1.4 | 46.5 | 3.29 |
| **RPD** | 16.593886 | 0 | 3.4334764 | 1.8518519 | 15.384615 | 0.6430868 | 5.6129985 |
| **6038** | 27.8 | 0.52 | 11.1 | 79 | 1.5 | 37.4 | 3.55 |
| **6180 (RE 6038)** | 25.6 | 0.52 | 10.7 | 77 | 1.6 | 37 | 3.61 |
| **RPD** | 8.2397004 | 0 | 3.6697248 | 2.5641026 | 6.4516129 | 1.0752688 | 1.6759777 |
| **6136** | 14 | 0.43 | 9.8 | 872 | 1.1 | 29.6 | 2.64 |
| **6181 (RE 6136)** | 19.4 | 0.25 | 6.6 | 527 | 0.5 | 17.8 | 1.67 |
| **RPD** | 32.335329 | 52.941176 | 39.02439 | 49.320944 | 75 | 49.78903 | 45.011601 |
| **6154** | 15.9 | 0.36 | 4.6 | 215 | 1.9 | 27 | 2.75 |
| **RE 6154** | 15 | 0.35 | 4.4 | 207 | 1.6 | 25.8 | 2.73 |
| **RPD** | 5.8252427 | 2.8169014 | 4.4444444 | 3.7914692 | 17.142857 | 4.5454545 | 0.729927 |
| **6027** | 12.3 | 0.54 | 5.4 | 266 | 1.8 | 40.9 | 3.06 |
| **RE 6027** | 10.5 | 0.54 | 5.5 | 270 | 8.7 | 41.5 | 3.36 |
| **RPD** | 15.789474 | 0 | 1.8348624 | 1.4925373 | 131.42857 | 1.4563107 | 9.3457944 |
| **Average RPD** | 10.441284 | 9.4770999 | 10.732452 | 7.0310511 | 30.912132 | 9.1107723 | 7.0929933 |

***Analysis: GROUP 4B - REE - 0.200 GM, RPD***

| **ELEMENT** | **Zr ppm** |
|---|---|
| **SI** | **85.7** |
| **LDL** | **0.5** |
| **SAMPLES** | |
| **221** | 109.9 |
| **6175 (RE 221)** | 104.3 |
| **RPD** | 5.2287582 |
| **242** | 97.3 |
| **6176 (RE 242)** | 101.3 |
| **RPD** | 4.0281974 |
| **263** | 179.3 |
| **RE 263** | 177.1 |
| **RPD** | 1.2345679 |
| **320** | 122 |
| **6177 (RE 320)** | 116.1 |
| **RPD** | 4.9559009 |
| **356** | 133 |
| **6178 (RE 356)** | 130.2 |
| **RPD** | 2.1276596 |
| **4566** | 101.9 |
| **6179 (RE 4566)** | 95.9 |
| **RPD** | 6.0667341 |
| **4577** | 151.1 |
| **RE 4577** | 146.1 |
| **RPD** | 3.3647376 |
| **6038** | 146.1 |
| **6180 (RE 6038)** | 145.6 |
| **RPD** | 0.342818 |
| **6136** | 196.9 |
| **6181 (RE 6136)** | 217.6 |
| **RPD** | 9.9879373 |
| **6154** | 152.2 |
| **RE 6154** | 150.1 |
| **RPD** | 1.3893483 |
| **6027** | 188.7 |
| **RE 6027** | 183.1 |
| **RPD** | 3.0123722 |
| **Average RPD** | 3.7944574 |

***Analysis: GROUP 4A - 0.200 GM, RPD***

| **ELEMENT** | **Al2O3**<br>**%** | **Ba**<br>**ppm** | **CaO**<br>**%** | **Cr2O3**<br>**%** | **Cr2O3**<br>**%** | **Fe2O3**<br>**%** | **K2O**<br>**%** |
|---|---|---|---|---|---|---|---|
| **SI** | | | | | | | |
| **LDL** | **0.03** | **5** | **0.01** | **0.001** | **0.001** | **0.04** | **0.04** |
| **SAMPLES** | | | | | | | |
| **221** | 12.82 | 641 | 6.23 | 0.012 | 0.0097 | 5.25 | 2.03 |
| **6175 (RE 221)** | 12.8 | 591 | 7.88 | 0.008 | 0.008 | 4.74 | 1.66 |
| **RPD** | 0.156128 | 8.1168831 | 23.387668 | 40 | 19.20904 | 10.21021 | 20.054201 |
| **242** | 13.45 | 640 | 5.48 | 0.011 | 0.0131 | 4.99 | 2.66 |
| **6176 (RE 242)** | 13.57 | 653 | 4.61 | 0.012 | 0.0119 | 4.4 | 2.61 |
| **RPD** | 0.8882309 | 2.0108275 | 17.244797 | 8.6956522 | 9.6 | 12.56656 | 1.8975332 |
| **263** | 17.31 | 476 | 0.28 | 0.01 | 0.01 | 4.72 | 2.06 |
| **RE 263** | 17.25 | 468 | 0.29 | 0.007 | 0.0098 | 4.82 | 2.06 |
| **RPD** | 0.3472222 | 1.6949153 | 3.5087719 | 35.294118 | 2.020202 | 2.0964361 | 0 |
| **320** | 15.06 | 1063 | 5.76 | 0.012 | 0.015 | 4.5 | 2.77 |
| **6177 (RE 320)** | 14.68 | 971 | 6.45 | 0.015 | 0.0149 | 4.53 | 2.67 |
| **RPD** | 2.5554808 | 9.0462144 | 11.302211 | 22.222222 | 0.6688963 | 0.6644518 | 3.6764706 |
| **356** | 15.49 | 1010 | 2.96 | 0.015 | 0.0149 | 4.53 | 2.79 |
| **6178 (RE 356)** | 15.7 | 1039 | 2.66 | 0.015 | 0.0153 | 4.72 | 2.85 |
| **RPD** | 1.3465854 | 2.8306491 | 10.676157 | 0 | 2.6490066 | 4.1081081 | 2.1276596 |
| **4566** | 13.59 | 742 | 12.81 | 0.012 | 0.0124 | 5.22 | 2.33 |
| **6179 (RE 4566)** | 13.19 | 762 | 12.69 | 0.013 | 0.0125 | 5.86 | 2.26 |
| **RPD** | 2.987304 | 2.6595745 | 0.9411765 | 8 | 0.8032129 | 11.552347 | 3.0501089 |
| **4577** | 13.69 | 806 | 4.9 | 0.013 | 0.0126 | 5.04 | 2.33 |
| **RE 4577** | 13.6 | 806 | 4.88 | 0.013 | 0.0126 | 5.01 | 2.33 |
| **RPD** | 0.6595823 | 0 | 0.408998 | 0 | 0 | 0.5970149 | 0 |
| **6038** | 17.26 | 413 | 0.54 | 0.005 | 0.0049 | 3.69 | 1.22 |
| **6180 (RE 6038)** | 16.99 | 428 | 0.58 | 0.005 | 0.0051 | 4 | 1.19 |
| **RPD** | 1.5766423 | 3.5671819 | 7.1428571 | 0 | 4 | 8.0624187 | 2.4896266 |
| **6136** | 14.92 | 534 | 2.86 | 0.009 | 0.0092 | 4.81 | 1.51 |
| **6181 (RE 6136)** | 16.4 | 373 | 2.05 | 0.005 | 0.0046 | 4.15 | 0.84 |
| **RPD** | 9.4508301 | 35.501654 | 32.99389 | 57.142857 | 66.666667 | 14.732143 | 57.021277 |
| **6154** | 16.98 | 780 | 0.4 | 0.014 | 0.0141 | 4.93 | 2.87 |
| **RE 6154** | 17.03 | 788 | 0.37 | 0.014 | 0.0143 | 4.94 | 2.91 |
| **RPD** | 0.2940312 | 1.0204082 | 7.7922078 | 0 | 1.4084507 | 0.2026342 | 1.384083 |
| **6027** | 12.02 | 793.9 | 2.06 | 0.0124 | | 3.62 | 2.45 |
| **RE 6027** | 12.07 | 801.5 | 2.06 | 0.0124 | | 3.62 | 2.42 |
| **RPD** | 0.41511 | 0.9527391 | 0 | 0 | | 0 | 1.2320329 |
| **Average RPD** | 1.8797407 | 6.1273679 | 10.490794 | 15.577714 | 9.7295886 | 5.8902112 | 8.4484538 |

***Analysis: GROUP 4A - 0.200 GM, RPD***

| **ELEMENT** | **LOI<br>%** | **MgO<br>%** | **MnO<br>%** | **Na2O<br>%** | **Ni<br>ppm** | **P2O5<br>%** | **Sc<br>ppm** |
|---|---|---|---|---|---|---|---|
| **SI** | | | | | | | |
| **LDL** | **0.1** | **0.01** | **0.01** | **0.01** | **30** | **0.01** | **1** |
| **SAMPLES** | | | | | | | |
| **221** | 17.2 | 1.69 | 0.02 | 1.13 | 34 | 0.24 | 10 |
| **6175 (RE 221)** | 18 | 1.98 | 0.02 | 1.28 | 27 | 0.33 | 11 |
| **RPD** | 4.5454545 | 15.803815 | 0 | 12.448133 | 22.95082 | 31.578947 | 9.5238095 |
| **242** | 18.7 | 1.46 | 0.02 | 0.8 | 40 | 0.17 | 10 |
| **6176 (RE 242)** | 18.6 | 1.45 | 0.02 | 0.81 | 38 | 0.18 | 12 |
| **RPD** | 0.536193 | 0.6872852 | 0 | 1.242236 | 5.1282051 | 5.7142857 | 18.181818 |
| **263** | 10.8 | 1.22 | 0.04 | 1.22 | 57 | 0.07 | 14 |
| **RE 263** | 10.8 | 1.24 | 0.04 | 1.19 | 55 | 0.06 | 14 |
| **RPD** | 0 | 1.6260163 | 0 | 2.4896266 | 3.5714286 | 15.384615 | 0 |
| **320** | 13.7 | 1.56 | 0.01 | 0.58 | 70 | 0.19 | 17 |
| **6177 (RE 320)** | 13.9 | 1.53 | 0.01 | 0.68 | 76 | 0.19 | 16 |
| **RPD** | 1.4492754 | 1.9417476 | 0 | 15.873016 | 8.2191781 | 0 | 6.0606061 |
| **356** | 11 | 1.49 | 0.01 | 0.54 | 47 | 0.21 | 14 |
| **6178 (RE 356)** | 10.9 | 1.47 | 0.01 | 0.58 | 67 | 0.19 | 15 |
| **RPD** | 0.913242 | 1.3513514 | 0 | 7.1428571 | 35.087719 | 10 | 6.8965517 |
| **4566** | 18.2 | 1.61 | 0.01 | 0.5 | 68 | 0.19 | 15 |
| **6179 (RE 4566)** | 19.1 | 1.66 | 0.02 | 0.48 | 61 | 0.21 | 15 |
| **RPD** | 4.8257373 | 3.058104 | 66.666667 | 4.0816327 | 10.852713 | 10 | 0 |
| **4577** | 13.9 | 1.45 | 0.02 | 0.67 | 38 | 0.55 | 13 |
| **RE 4577** | 14.2 | 1.44 | 0.02 | 0.66 | 62 | 0.58 | 13 |
| **RPD** | 2.1352313 | 0.6920415 | 0 | 1.5037594 | 48 | 5.3097345 | 0 |
| **6038** | 12.5 | 2.03 | 0.05 | 2.13 | *10* | 0.07 | 8 |
| **6180 (RE 6038)** | 12.5 | 1.95 | 0.05 | 2.02 | 64 | 0.06 | 10 |
| **RPD** | 0 | 4.0201005 | 0 | 5.3012048 | 145.94595 | 15.384615 | 22.222222 |
| **6136** | 20 | 2.9 | 0.03 | 0.79 | 66 | 0.17 | 12 |
| **6181 (RE 6136)** | 19.5 | 3.81 | 0.05 | 1.01 | 61 | 0.09 | 10 |
| **RPD** | 2.5316456 | 27.123696 | 50 | 24.444444 | 7.8740157 | 61.538462 | 18.181818 |
| **6154** | 9.9 | 1.56 | 0.02 | 0.61 | 46 | 0.17 | 17 |
| **RE 6154** | 9.6 | 1.56 | 0.02 | 0.63 | 42 | 0.17 | 16 |
| **RPD** | 3.0769231 | 0 | 0 | 3.2258065 | 9.0909091 | 0 | 6.0606061 |
| **6027** | 9.3 | 1.15 | 0.02 | 0.94 | 31 | 0.24 | 12 |
| **RE 6027** | 9.1 | 1.15 | 0.02 | 0.91 | 33 | 0.25 | 12 |
| **RPD** | 2.173913 | 0 | 0 | 3.2432432 | 6.25 | 4.0816327 | 0 |
| **Average RPD** | 2.0170559 | 5.1185597 | 10.606061 | 7.363269 | 27.542812 | 14.453845 | 7.9206756 |
| | | | | | **1 sample<br><LDL** | | |

***Analysis: GROUP 4A - 0.200 GM, RPD***

| **ELEMENT** | $SiO_2$ % | $TiO_2$ % | TOT/C % | TOT/S % | SUM % |
|---|---|---|---|---|---|
| **SI** | | | | | |
| **LDL** | **0.02** | **0.01** | **0.01** | **0.01** | |
| **SAMPLES** | | | | | |
| **221** | 52.53 | 0.55 | 6.03 | 3.58 | 99.77 |
| **6175 (RE 221)** | 50.52 | 0.48 | 5.51 | 3.3 | 99.78 |
| **RPD** | 3.9010189 | 13.592233 | 9.0121317 | 8.1395349 | 0.0100226 |
| **242** | 51.39 | 0.57 | 6.43 | 3.44 | 99.78 |
| **6176 (RE 242)** | 52.84 | 0.57 | 6.43 | 3.51 | 99.75 |
| **RPD** | 2.7823084 | 0 | 0 | 2.0143885 | 0.0300707 |
| **263** | 61.17 | 0.81 | 1.53 | 0.77 | 99.77 |
| **RE 263** | 61.13 | 0.8 | 1.66 | 0.83 | 99.75 |
| **RPD** | 0.0654129 | 1.242236 | 8.1504702 | 7.5 | 0.0200481 |
| **320** | 54.82 | 0.68 | 4.53 | 2.01 | 99.77 |
| **6177 (RE 320)** | 54.32 | 0.68 | 4.78 | 2.15 | 99.78 |
| **RPD** | 0.9162544 | 0 | 5.3705693 | 6.7307692 | 0.0100226 |
| **356** | 59.51 | 0.74 | 3.29 | 2.32 | 99.4 |
| **6178 (RE 356)** | 59.91 | 0.75 | 3.02 | 2.44 | 99.88 |
| **RPD** | 0.6699045 | 1.3422819 | 8.5578447 | 5.0420168 | 0.4817342 |
| **4566** | 44.78 | 0.62 | 6.8 | 2.43 | 99.96 |
| **6179 (RE 4566)** | 43.56 | 0.6 | 6.62 | 2.87 | 99.74 |
| **RPD** | 2.7620557 | 3.2786885 | 2.6825633 | 16.603774 | 0.2203305 |
| **4577** | 56.22 | 0.67 | 5.41 | 2.45 | 99.55 |
| **RE 4577** | 56.05 | 0.67 | 5.51 | 2.61 | 99.54 |
| **RPD** | 0.3028414 | 0 | 1.8315018 | 6.3241107 | 0.0100457 |
| **6038** | 59.36 | 0.42 | 1.87 | 0.16 | 99.32 |
| **6180 (RE 6038)** | 60.08 | 0.43 | 1.89 | 0.18 | 99.91 |
| **RPD** | 1.2056263 | 2.3529412 | 1.0638298 | 11.764706 | 0.5922803 |
| **6136** | 51.21 | 0.46 | 5.99 | 3.96 | 99.74 |
| **6181 (RE 6136)** | 51.54 | 0.34 | 2.65 | 3.36 | 99.83 |
| **RPD** | 0.6423358 | 30 | 77.314815 | 16.393443 | 0.0901939 |
| **6154** | 61.55 | 0.8 | 1.64 | 1.95 | 99.91 |
| **RE 6154** | 61.73 | 0.8 | 1.7 | 1.96 | 99.88 |
| **RPD** | 0.2920182 | 0 | 3.5928144 | 0.511509 | 0.0300315 |
| **6027** | 66.96 | 0.68 | 2.38 | 1.53 | 99.45 |
| **RE 6027** | 67.33 | 0.67 | 2.43 | 1.61 | 99.63 |
| **RPD** | 0.5510462 | 1.4814815 | 2.0790021 | 5.0955414 | 0.1808318 |
| **Average RPD** | 1.2809839 | 4.8445329 | 10.877777 | 7.829072 | 0.1523284 |

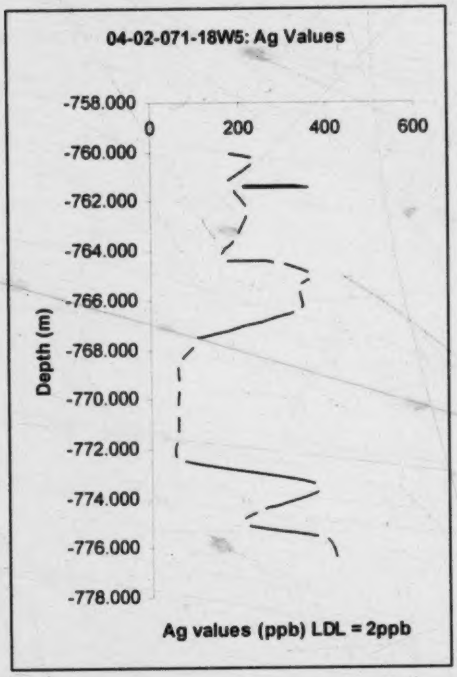
***Analysis: CO2, ACME File #A305987, RPD***

| **ELEMENT** | **C/ORG** | **C/GRA** | **CO2** | **SO4** |
|---|---|---|---|---|
| | **%** | **%** | **%** | **%** |
| **SI** | **2.34** | **< .02** | **0.06** | **0.26** |
| **LDL** | | | | |
| **SAMPLES** | | | | |
| **221** | 5.04 | 0.03 | 3.51 | 4.02 |
| **6175 (RE 221)** | 4.22 | 0.02 | 4.68 | 5.36 |
| **RPD** | 17.710583 | 40 | 28.571429 | 28.571429 |
| **242** | 6.34 | 0.05 | 0.15 | 5.24 |
| **6176 (RE 242)** | 5.78 | < .02 | 2.43 | 5.67 |
| **RPD** | 9.2409241 | N/A | 176.74419 | 7.8826764 |
| **263** | 1.51 | < .02 | 0.03 | 0.17 |
| **RE 263** | 1.55 | < .02 | 0.03 | 0.17 |
| **RPD** | 2.6143791 | N/A | 0 | 0 |
| **320** | 3.33 | 0.03 | 4.29 | 2.24 |
| **6177 (RE 320)** | 3.47 | 0.02 | 4.73 | 2.48 |
| **RPD** | 4.1176471 | 40 | 9.7560976 | 10.169492 |
| **356** | 2.57 | 0.04 | 2.51 | 1.23 |
| **6178 (RE 356)** | 2.4 | 0.03 | 2.19 | 1.6 |
| **RPD** | 6.8410463 | 28.571429 | 13.617021 | 26.14841 |
| **4566** | 4.37 | 0.04 | 8.78 | 4.49 |
| **6179 (RE 4566)** | 4.18 | < .02 | 8.9 | 4.87 |
| **RPD** | 4.4444444 | N/A | 1.3574661 | 8.1196581 |
| **4577** | 4.45 | < .02 | 3.48 | 2.7 |
| **RE 4577** | 4.57 | < .02 | 3.42 | 2.67 |
| **RPD** | 2.6607539 | N/A | 1.7391304 | 1.1173184 |
| **6038** | 1.7 | 0.02 | 0.53 | 0.16 |
| **6180 (RE 6038)** | 1.68 | 0.02 | 0.69 | 0.37 |
| **RPD** | 1.183432 | 0 | 26.229508 | 79.245283 |
| **6136** | 5.63 | 0.03 | 1.22 | 2.76 |
| **6181 (RE 6136)** | 2.53 | 0.02 | 0.35 | 3.05 |
| **RPD** | 75.980392 | 40 | 110.82803 | 9.9827883 |
| **6154** | 1.58 | 0.04 | 0.05 | 0.34 |
| **RE 6154** | 1.67 | 0.02 | 0.03 | 0.37 |
| **RPD** | 5.5384615 | 66.666667 | 50 | 8.4507042 |
| **6027** | 2.12 | 0.02 | 0.87 | 2.18 |
| **RE 6027** | 2.18 | < .02 | 0.88 | 1.97 |
| **RPD** | 2.7906977 | N/A | 1.1428571 | 10.120482 |
| **Average RPD** | 12.102069 | N/A | 38.18052 | 17.255295 |
| | | Over 25% samples <LDL | | |

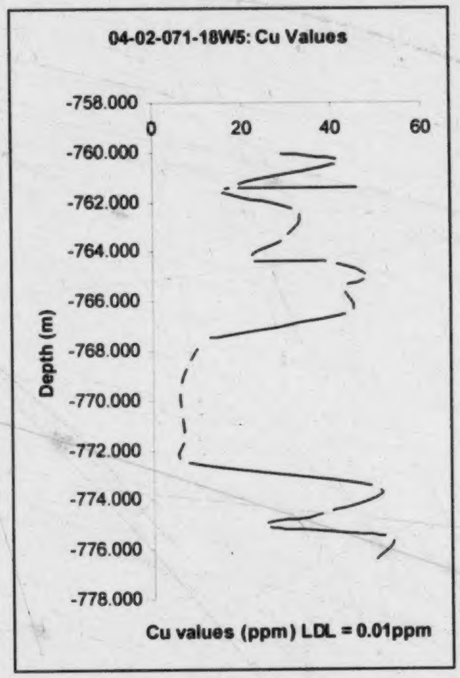
### 6.6 Elements vs. Depth For All Core

00/04-02-071-18W5/0

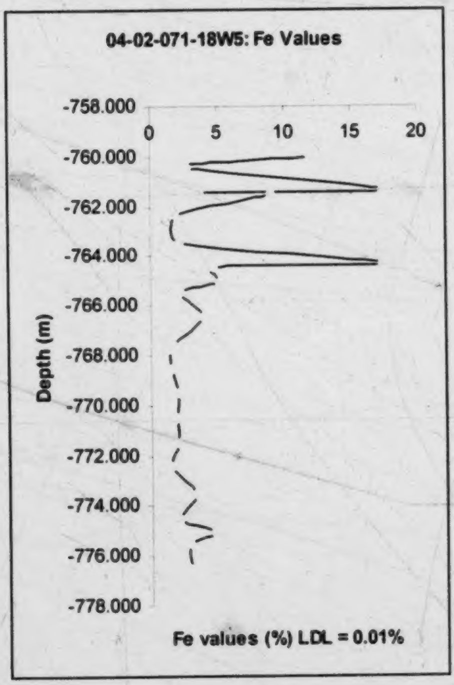
The core placement was determined based on geophysical logs and the lithology. The core does not represent an interval of the Second White Specks Formation. The core ranges form 758.92 m to 776.78 m, whereas the Second White Specks Formation interval ranges from 722 m to 740 m; therefore the core may represent the underlying Belle Fourche Formation or another underlying unit. The Ag, Cu, Fe, Ni, S and Zn values follow similar geochemical signatures with higher values at 760 to 767 m depth and again at 773 to 776.50 m depth. The lower metal values lie in between these intervals. When compared to the logged core, the first two intervals correspond to medium grey shales with sand laminations and abundant siderite nodules. The lower values correspond to a thick sand interval than ranges from approximately 767 to 773 m in depth. The peak values at 761 m depth correspond to the observation of pyrite and this is where the corresponding S peak correlates. The high values around 773 m depth correspond to an increase in organic matter.



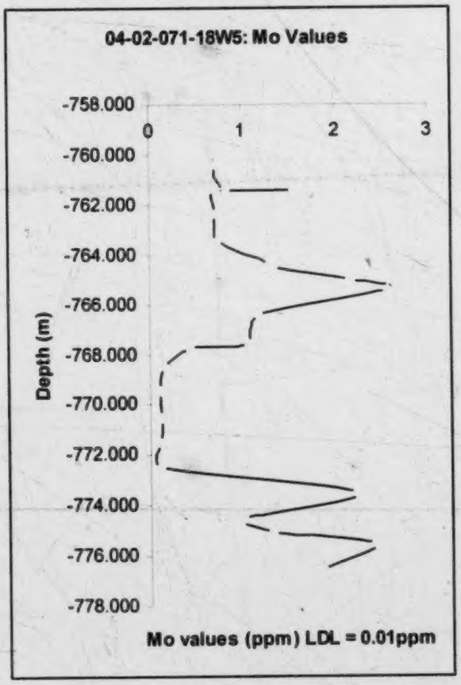
04-02-071-18W5: Ag Values



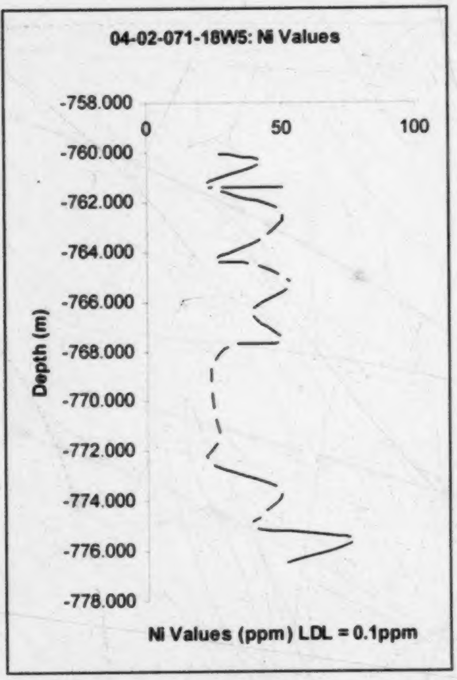
04-02-071-18W5: Cu Values

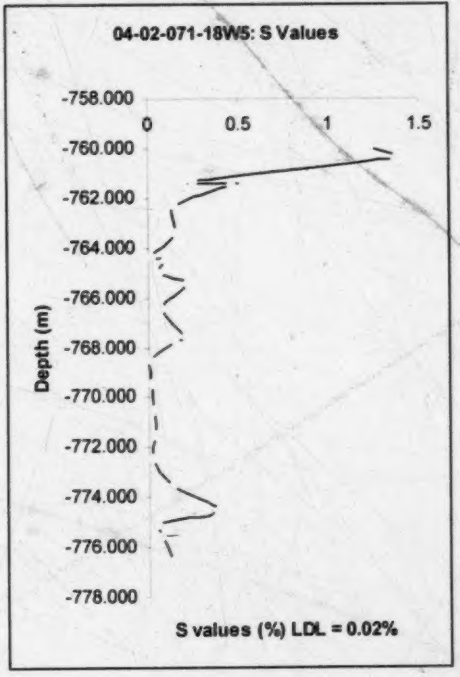


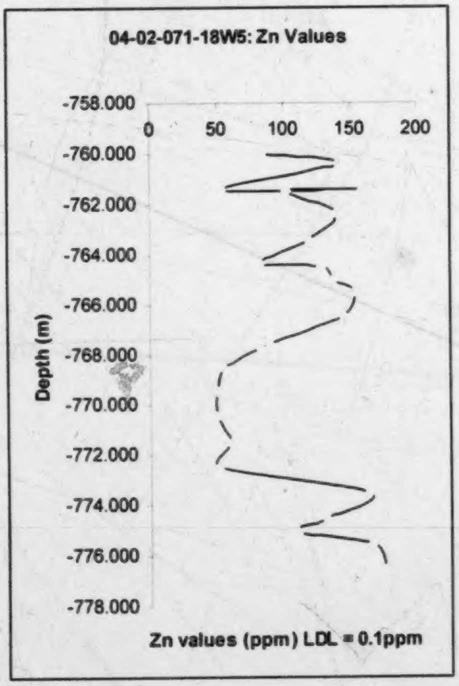
04-02-071-18W5: Fe Values

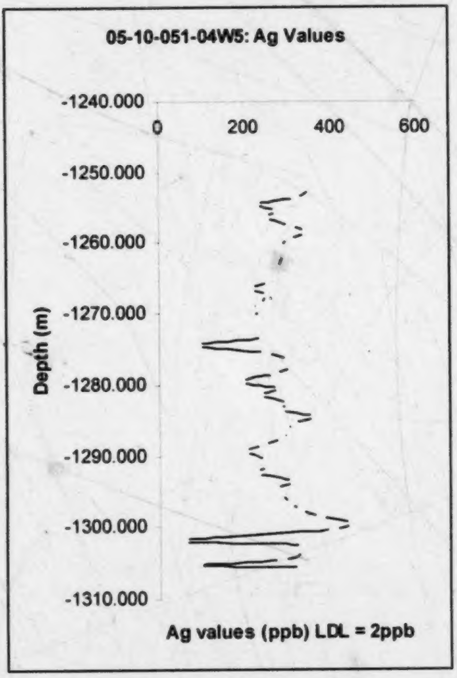


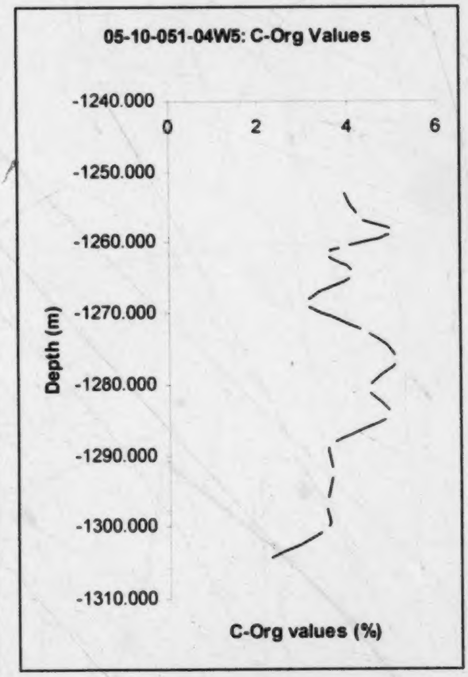
04-02-071-18W5: Mo Values

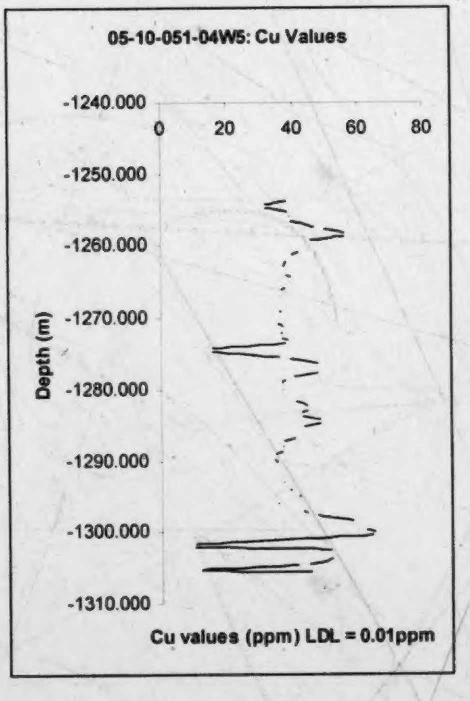

04-02-071-18W5: Ni Values
-758.000
-760.000
-762.000
-764.000
-766.000
-768.000
-770.000
-772.000
-774.000
-776.000
-778.000
0
50
100
Depth (m)
Ni Values (ppm) LDL = 0.1ppm

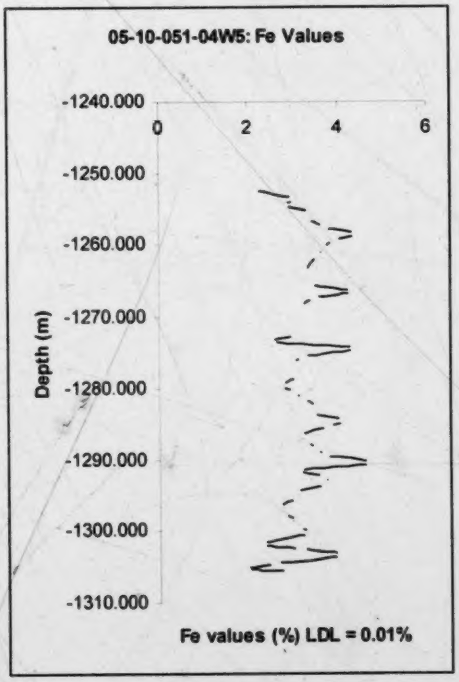

04-02-071-18W5: S Values
-758.000
-760.000
-762.000
-764.000
-766.000
-768.000
-770.000
-772.000
-774.000
-776.000
-778.000
0
0.5
1
1.5
Depth (m)
S values (%) LDL = 0.02%

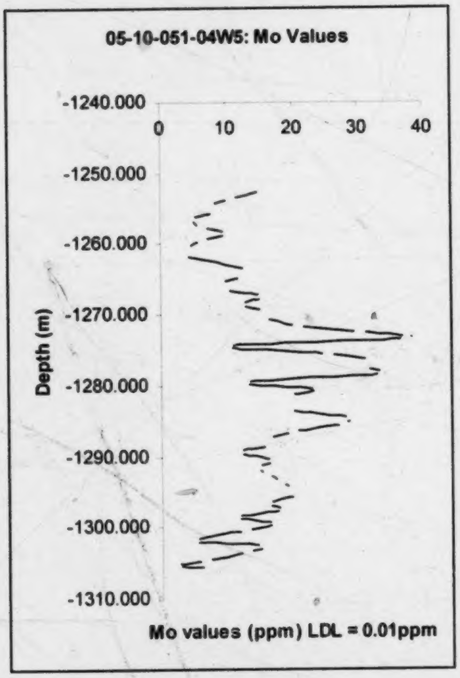

04-02-071-18W5: Zn Values
-758.000
-760.000
-762.000
-764.000
-766.000
-768.000
-770.000
-772.000
-774.000
-776.000
-778.000
0
50
100
150
200
Depth (m)
Zn values (ppm) LDL = 0.1ppm

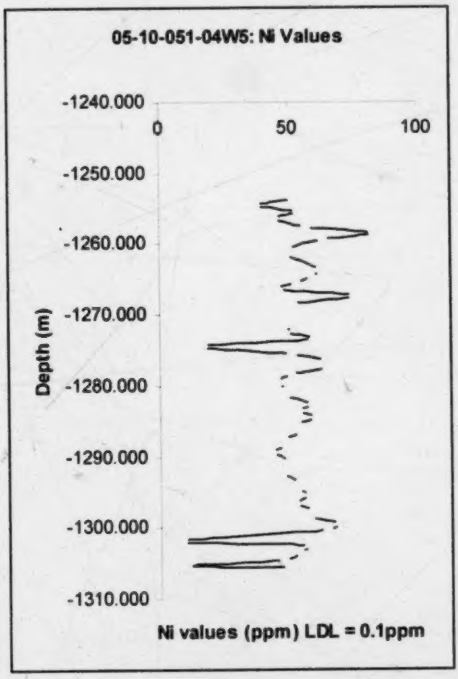

05-10-051-04W5: Ag Values

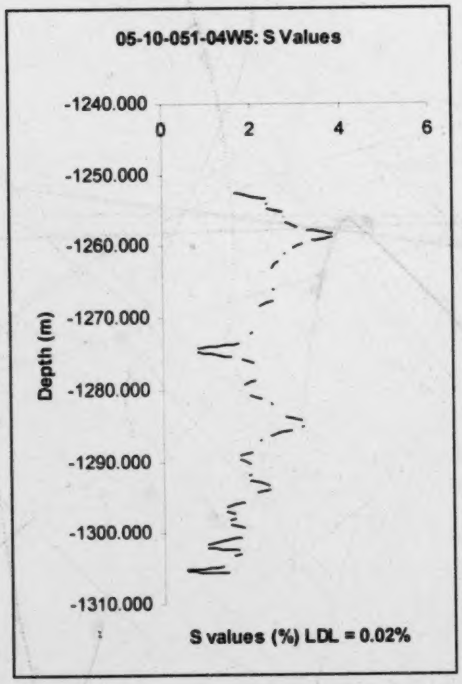

05-10-051-04W5: C-Org Values

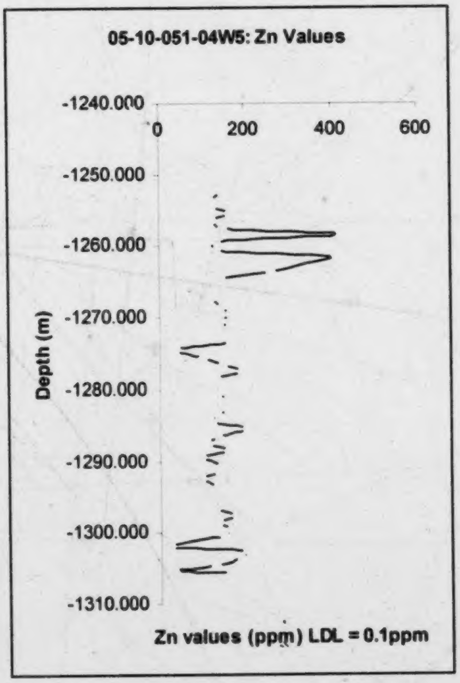

05-10-051-04W5: Cu Values

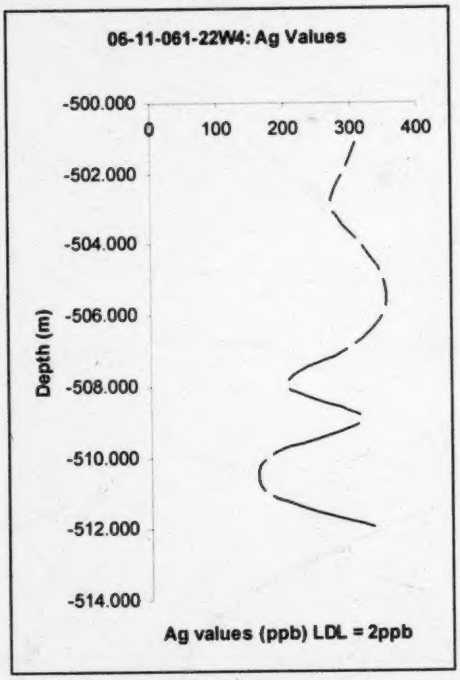

05-10-051-04W5: Fe Values

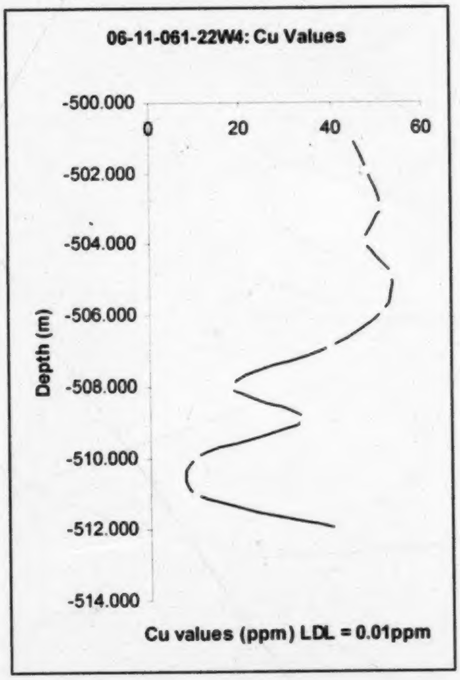

05-10-051-04W5: Mo Values
0
10
20
30
40
-1240.000
-1250.000
-1260.000
-1270.000
-1280.000
-1290.000
-1300.000
-1310.000
Depth (m)
Mo values (ppm) LDL = 0.01ppm

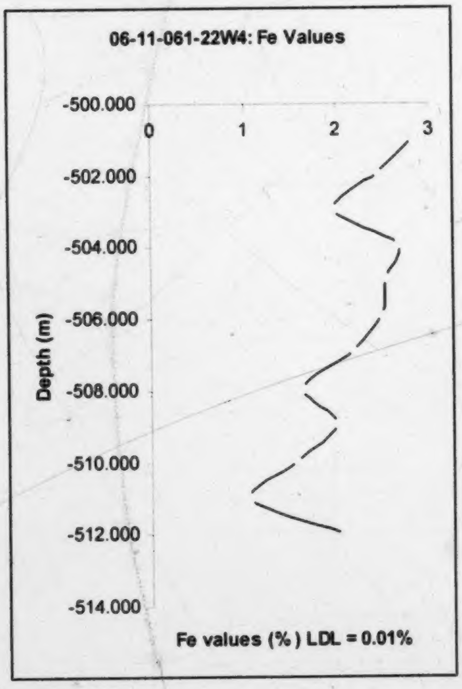

05-10-051-04W5: Ni Values
0
50
100
-1240.000
-1250.000
-1260.000
-1270.000
-1280.000
-1290.000
-1300.000
-1310.000
Depth (m)
Ni values (ppm) LDL = 0.1ppm

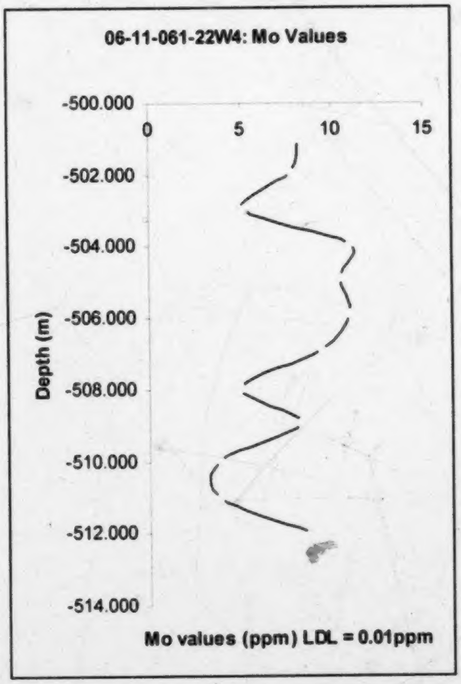

05-10-051-04W5: S Values
0
2
4
6
-1240.000
-1250.000
-1260.000
-1270.000
-1280.000
-1290.000
-1300.000
-1310.000
Depth (m)
S values (%) LDL = 0.02%

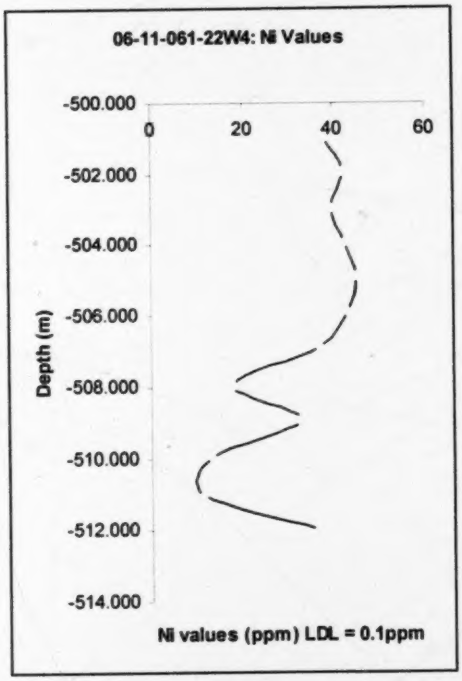

05-10-051-04W5: Zn Values
0
200
400
600
-1240.000
-1250.000
-1260.000
-1270.000
-1280.000
-1290.000
-1300.000
-1310.000
Depth (m)
Zn values (ppm) LDL = 0.1ppm

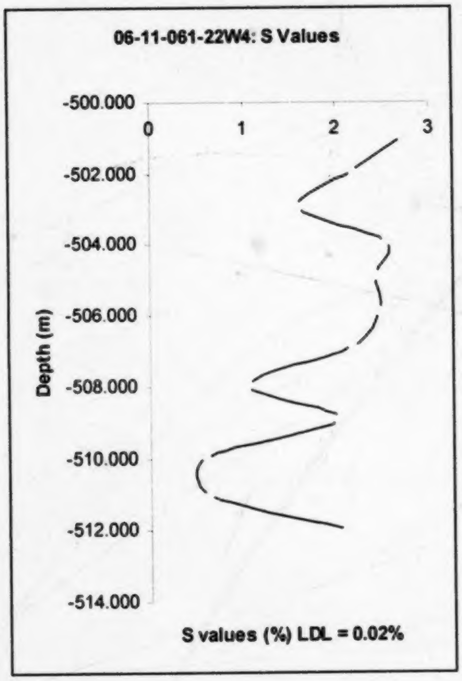

06-11-061-22W4: Ag Values

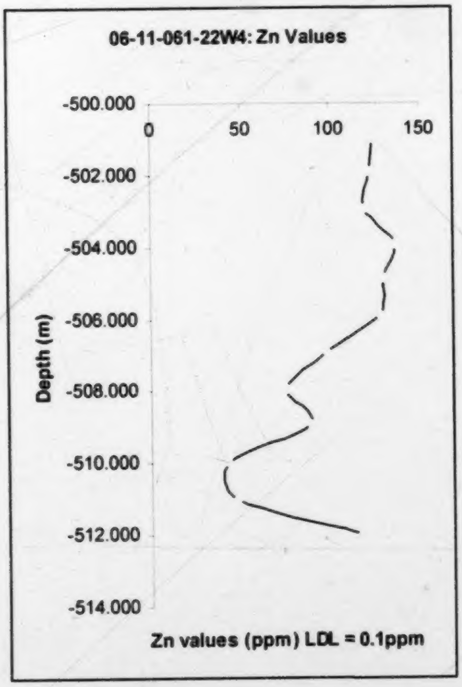

06-11-061-22W4: Cu Values

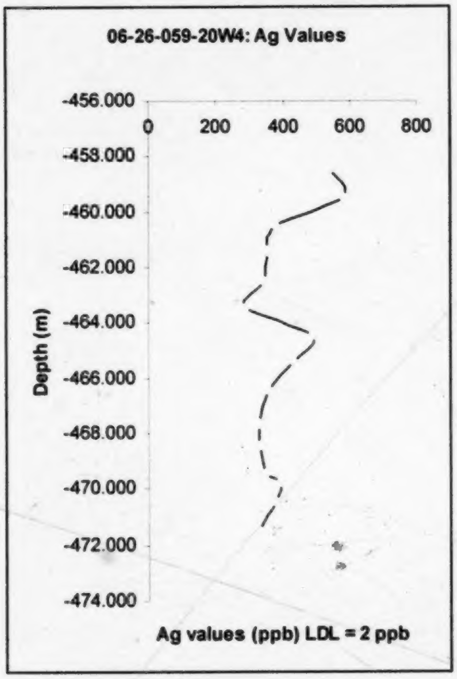

06-11-061-22W4: Fe Values

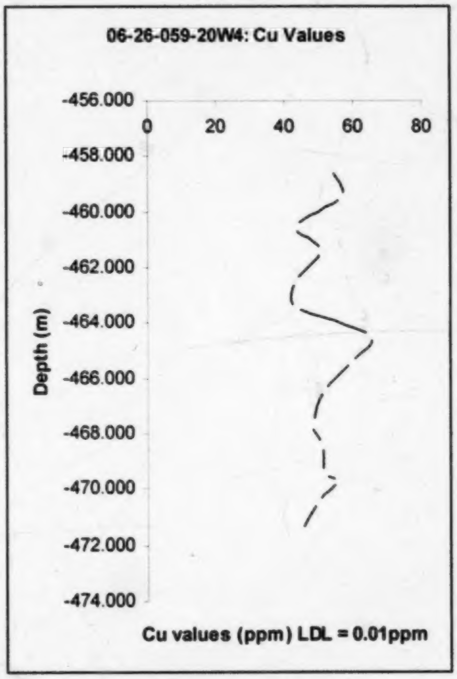

06-11-061-22W4: Mo Values

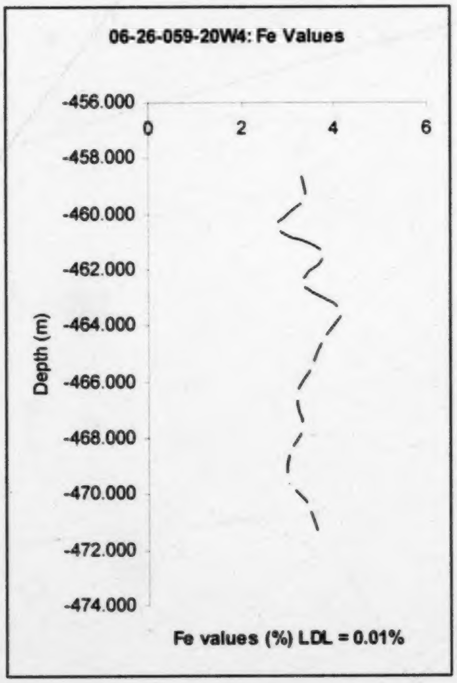

06-11-061-22W4: Ni Values
-500.000
-502.000
-504.000
-506.000
-508.000
-510.000
-512.000
-514.000
0
20
40
60
Depth (m)
Ni values (ppm) LDL = 0.1ppm

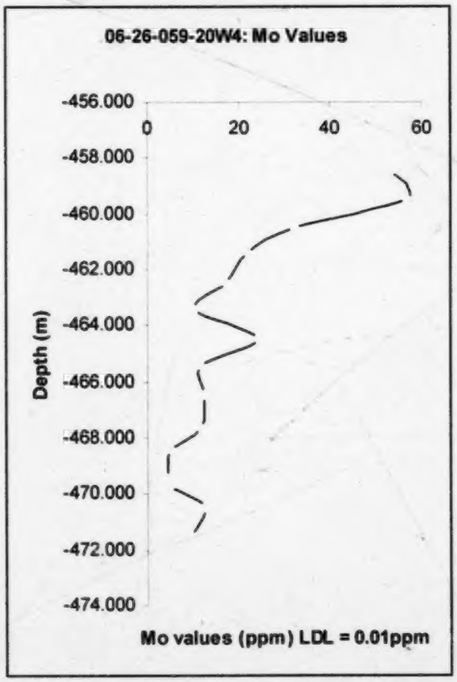

06-11-061-22W4: S Values
-500.000
-502.000
-504.000
-506.000
-508.000
-510.000
-512.000
-514.000
0
1
2
3
Depth (m)
S values (%) LDL = 0.02%

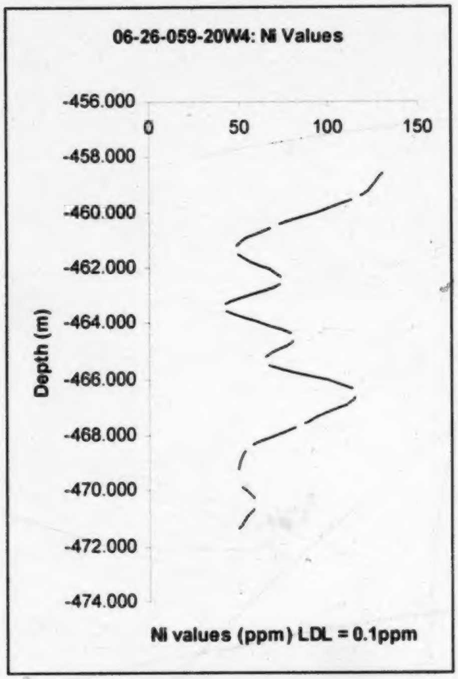

06-11-061-22W4: Zn Values
-500.000
-502.000
-504.000
-506.000
-508.000
-510.000
-512.000
-514.000
0
50
100
150
Depth (m)
Zn values (ppm) LDL = 0.1ppm

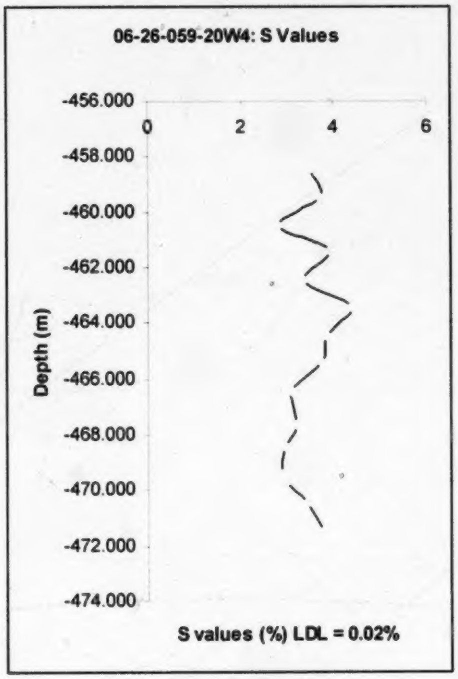

06-26-059-20W4: Ag Values

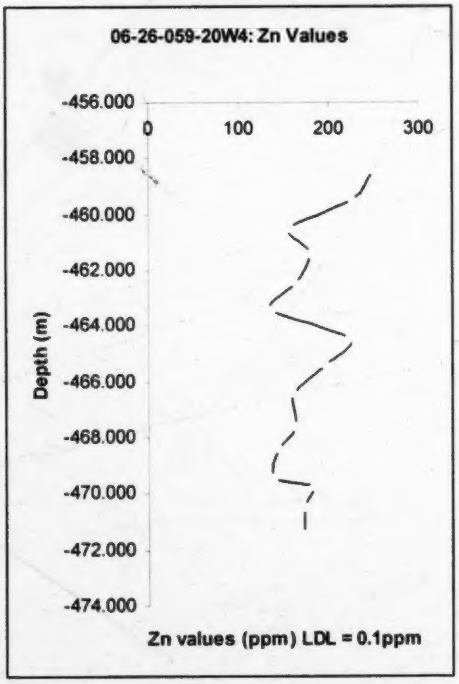

06-26-059-20W4: Cu Values

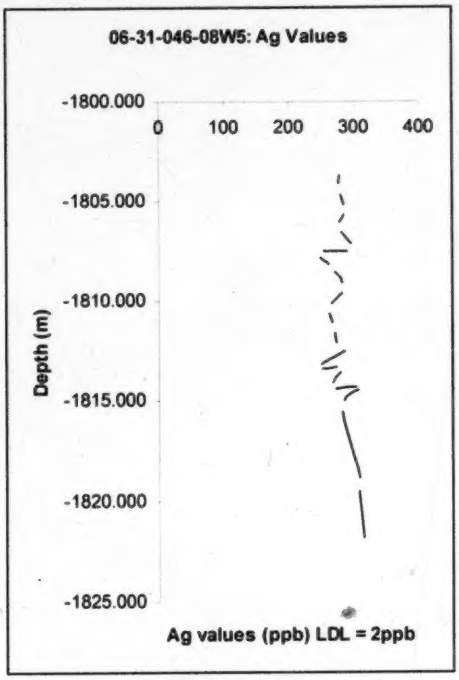

06-26-059-20W4: Fe Values

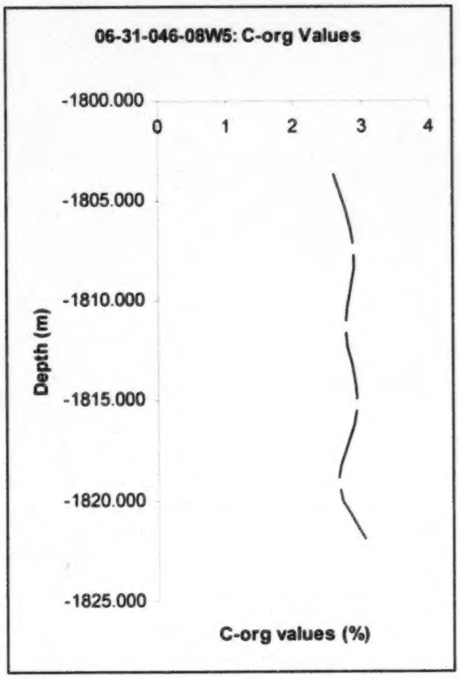

06-26-059-20W4: Mo Values

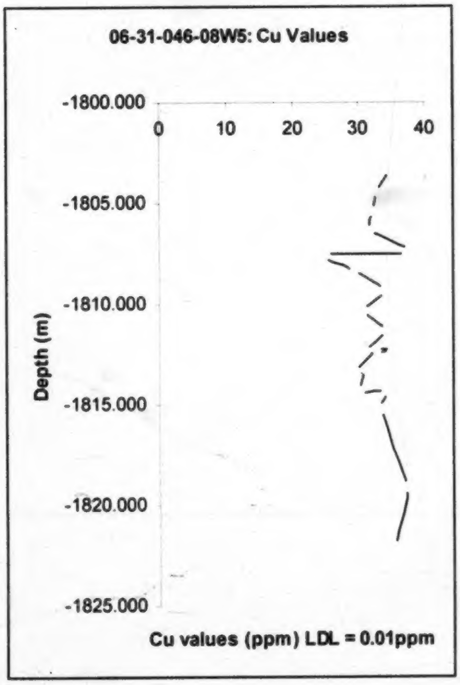

06-26-059-20W4: Ni Values
-456.000
-458.000
-460.000
-462.000
-464.000
-466.000
-468.000
-470.000
-472.000
-474.000
0
50
100
150
Depth (m)
Ni values (ppm) LDL = 0.1ppm

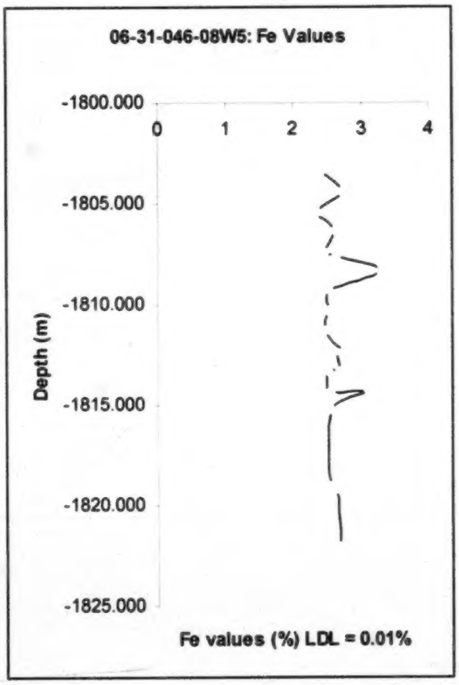

06-26-059-20W4: S Values
-456.000
-458.000
-460.000
-462.000
-464.000
-466.000
-468.000
-470.000
-472.000
-474.000
0
2
4
6
Depth (m)
S values (%) LDL = 0.02%

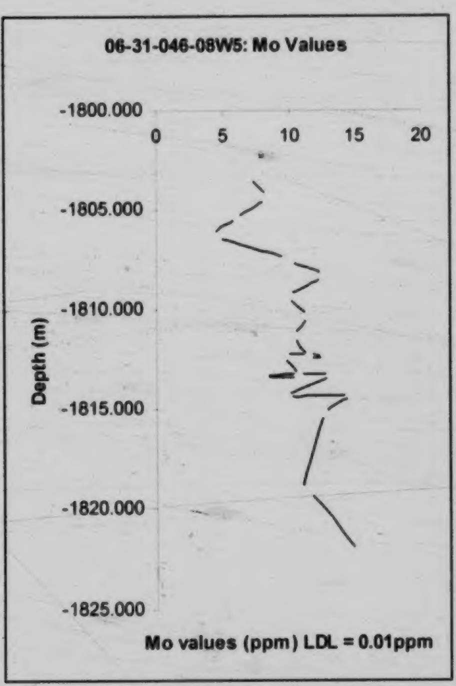

06-26-059-20W4: Zn Values
-456.000
-458.000
-460.000
-462.000
-464.000
-466.000
-468.000
-470.000
-472.000
-474.000
0
100
200
300
Depth (m)
Zn values (ppm) LDL = 0.1ppm


06-31-046-08W5: Ag Values

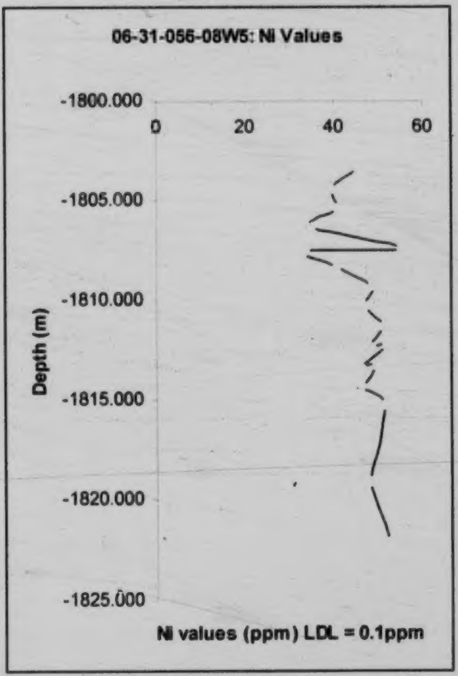

06-31-046-08W5: C-org Values


06-31-046-08W5: Cu Values

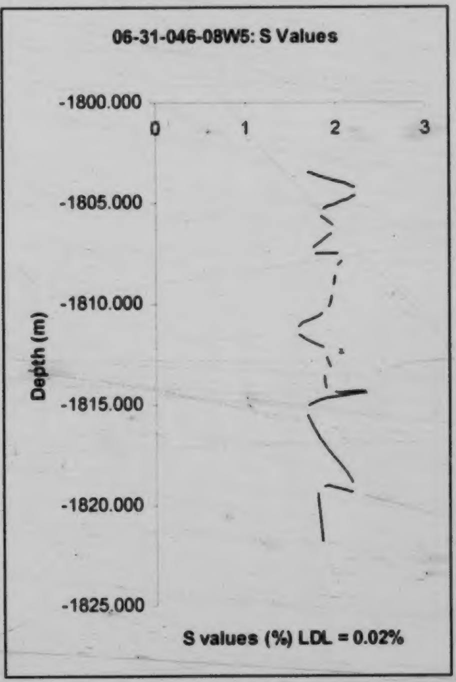

06-31-046-08W5: Fe Values



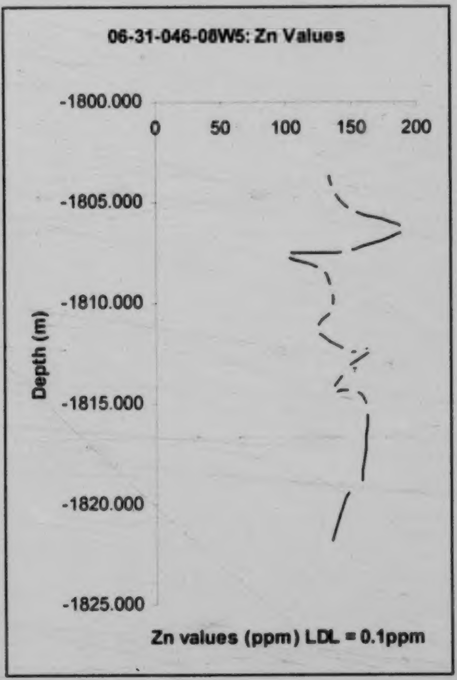
06-31-046-08W5: Mo Values



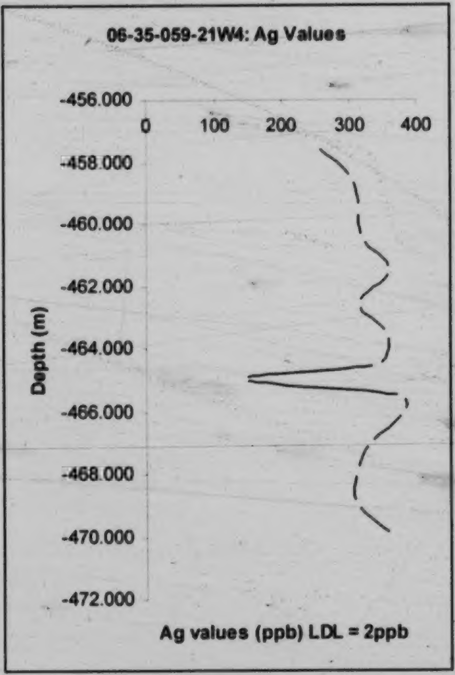
06-31-056-08W5: Ni Values

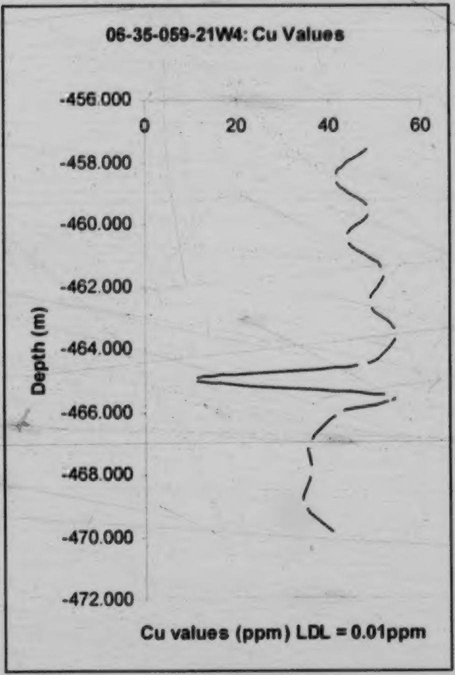


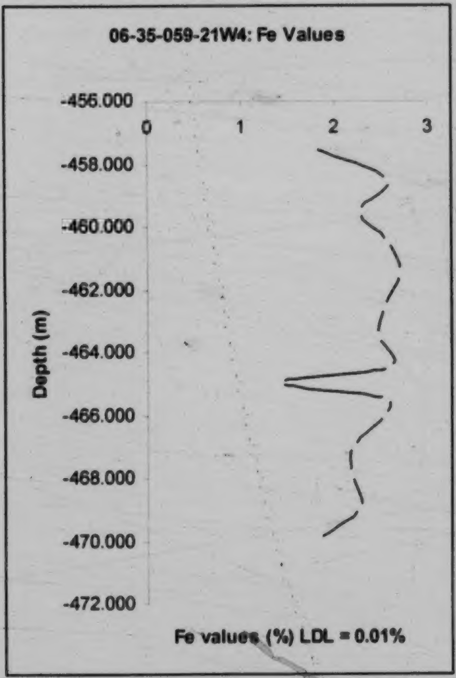
06-31-046-08W5: S Values

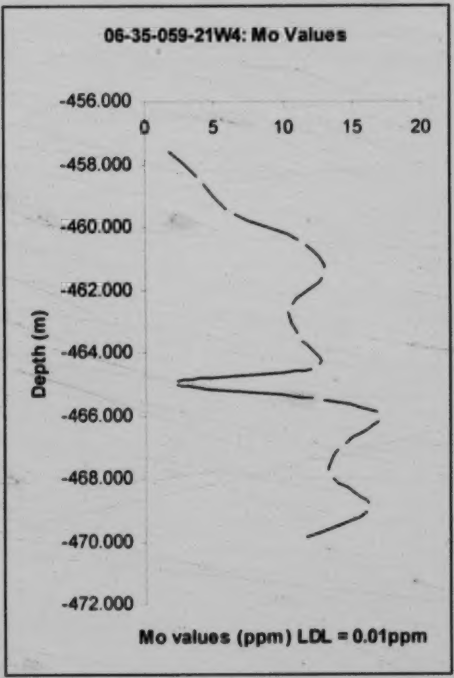


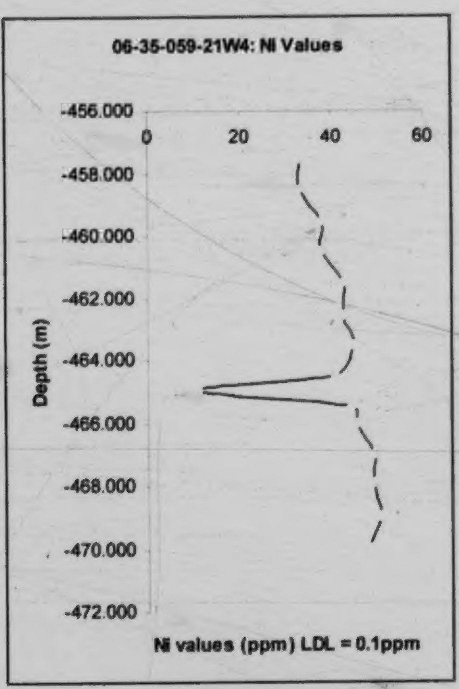
06-31-046-08W5: Zn Values

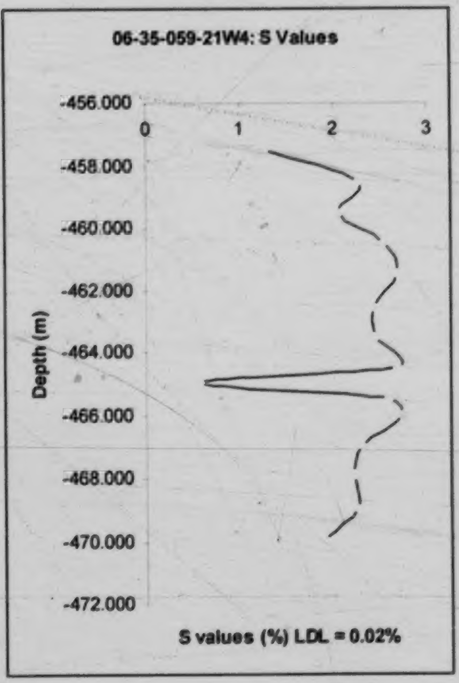

06-35-059-21W4: Ag Values
Depth (m)
-456.000
-458.000
-460.000
-462.000
-464.000
-466.000
-468.000
-470.000
-472.000
0
100
200
300
400
Ag values (ppb) LDL = 2ppb

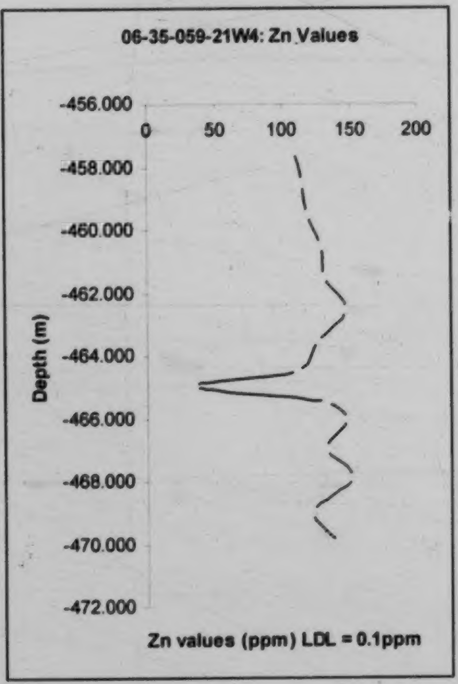

06-35-059-21W4: Cu Values
Depth (m)
-456.000
-458.000
-460.000
-462.000
-464.000
-466.000
-468.000
-470.000
-472.000
0
20
40
60
Cu values (ppm) LDL = 0.01ppm

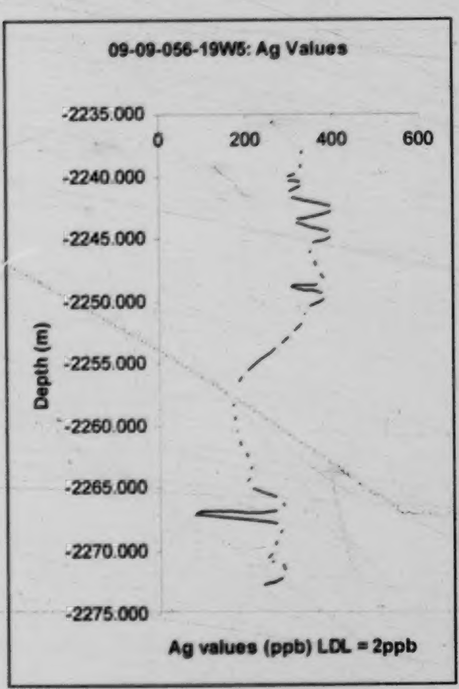

06-35-059-21W4: Fe Values
Depth (m)
-456.000
-458.000
-460.000
-462.000
-464.000
-466.000
-468.000
-470.000
-472.000
0
1
2
3
Fe values (%) LDL = 0.01%

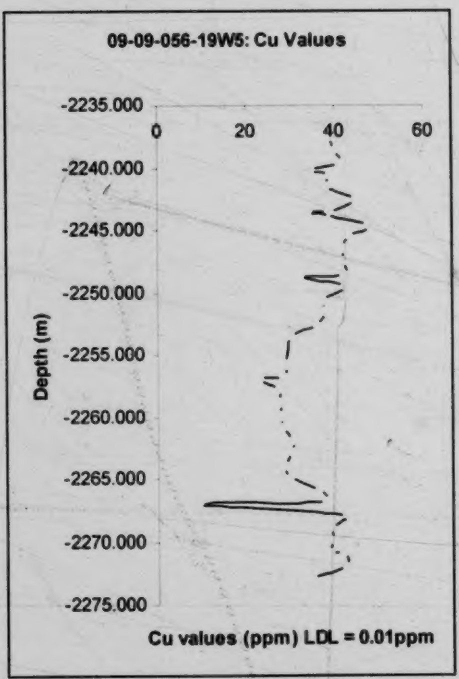

06-35-059-21W4: Mo Values
Depth (m)
-456.000
-458.000
-460.000
-462.000
-464.000
-466.000
-468.000
-470.000
-472.000
0
5
10
15
20
Mo values (ppm) LDL = 0.01ppm

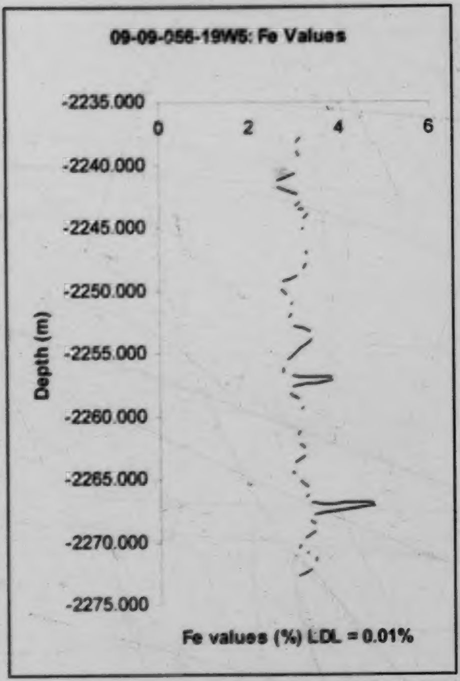

06-35-059-21W4: Ni Values

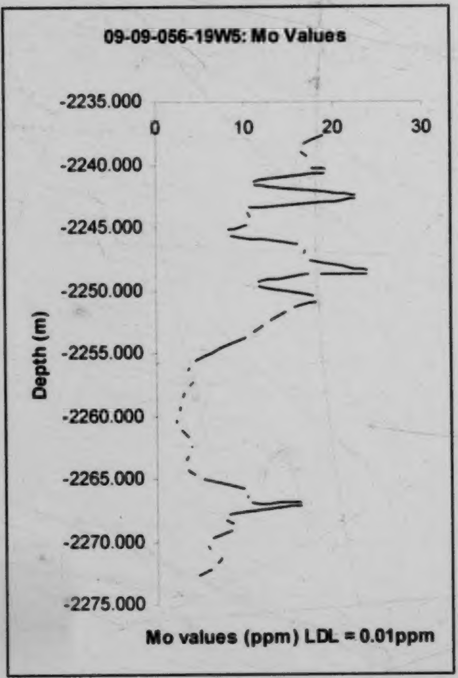

06-35-059-21W4: S Values

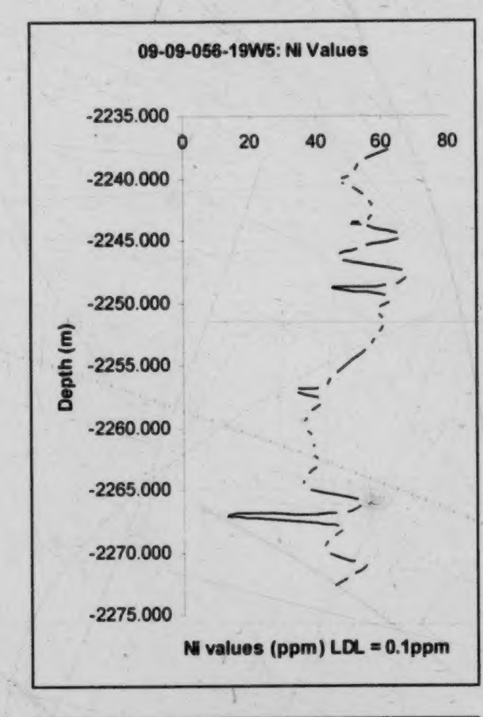

06-35-059-21W4: Zn Values

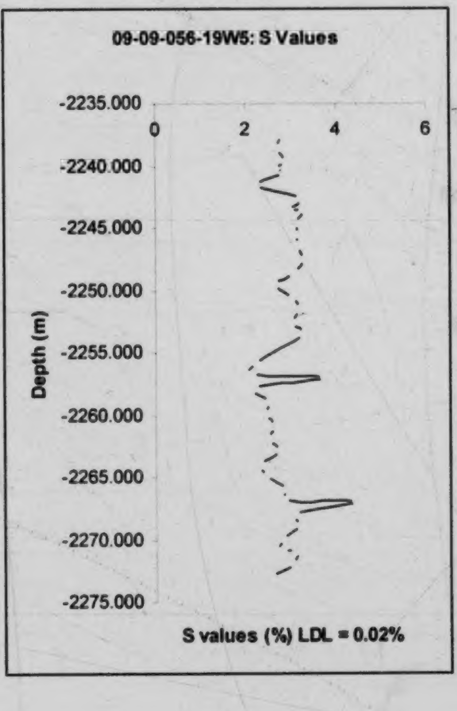

09-09-056-19W5: Ag Values
Depth (m)
-2235.000
-2240.000
-2245.000
-2250.000
-2255.000
-2260.000
-2265.000
-2270.000
-2275.000
0
200
400
600
Ag values (ppb) LDL = 2ppb

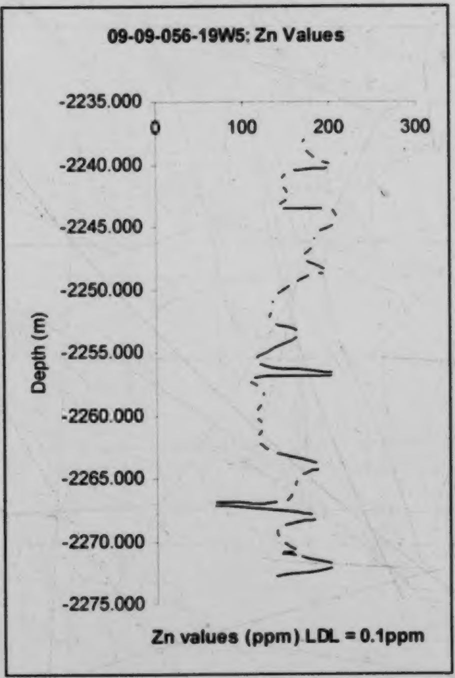

09-09-056-19W5: Cu Values
Depth (m)
-2235.000
-2240.000
-2245.000
-2250.000
-2255.000
-2260.000
-2265.000
-2270.000
-2275.000
0
20
40
60
Cu values (ppm) LDL = 0.01ppm


09-09-056-19W5: Fe Values
Depth (m)
-2235.000
-2240.000
-2245.000
-2250.000
-2255.000
-2260.000
-2265.000
-2270.000
-2275.000
0
2
4
6
Fe values (%) LDL = 0.01%


09-09-056-19W5: Mo Values
Depth (m)
-2235.000
-2240.000
-2245.000
-2250.000
-2255.000
-2260.000
-2265.000
-2270.000
-2275.000
0
10
20
30
Mo values (ppm) LDL = 0.01ppm

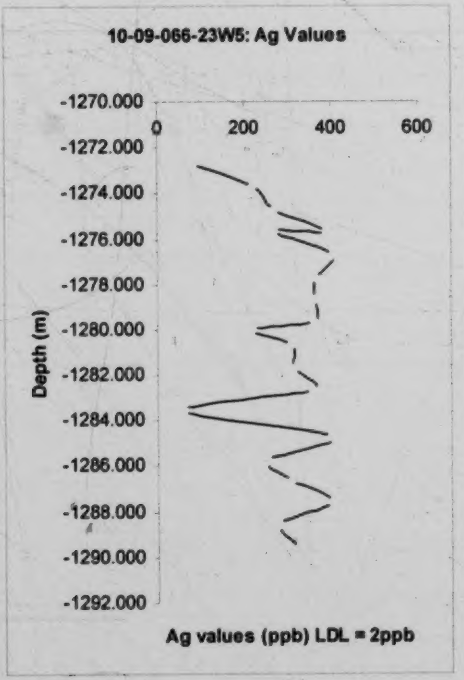

09-09-056-19W5: Ni Values
-2235.000
-2240.000
-2245.000
-2250.000
-2255.000
-2260.000
-2265.000
-2270.000
-2275.000
0
20
40
60
80
Depth (m)
Ni values (ppm) LDL = 0.1ppm

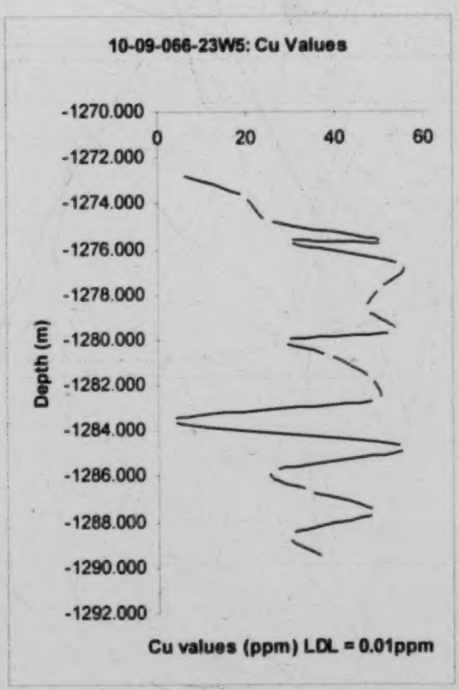

09-09-056-19W5: S Values
-2235.000
-2240.000
-2245.000
-2250.000
-2255.000
-2260.000
-2265.000
-2270.000
-2275.000
0
2
4
6
Depth (m)
S values (%) LDL = 0.02%

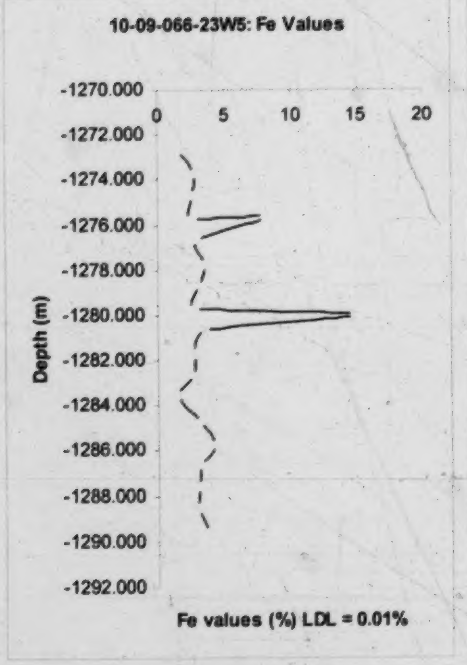

09-09-056-19W5: Zn Values
-2235.000
-2240.000
-2245.000
-2250.000
-2255.000
-2260.000
-2265.000
-2270.000
-2275.000
0
100
200
300
Depth (m)
Zn values (ppm) LDL = 0.1ppm

00/10-09-066-23W5/0

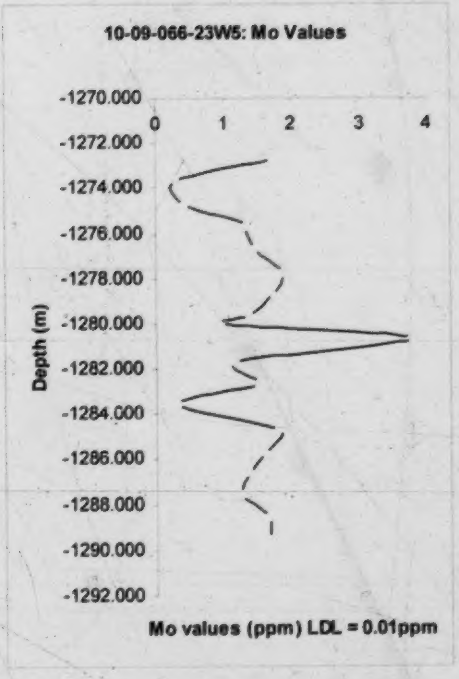
The core placement was determined based on micropaleontology and lithology. The core ranges from 1272.48 m to 1290.46 m, whereas the Second White Specks Formation appears to have a range from 1106 m to 1235 m. Therefore, this core does not represent the Second White Specks Formation, but instead represents a formation that is stratigraphically lower, perhaps the Belle Fourche or another underlying formation. The geochemical responses are very variable, but have low values at approximately 1283.5 m for Ag, Cu, Ni and Zn which corresponds to a sandy interval. Otherwise, all of these values are fairly high. The variations in signatures appear to correspond with varying amounts of sand and siderite nodules. The values of S, Mo and Fe are fairly low compared to the Second White Specks Formation values observed in other core and show a high value at approximately 1281 m depth, but does not appear to correlate to anything observed within the core.



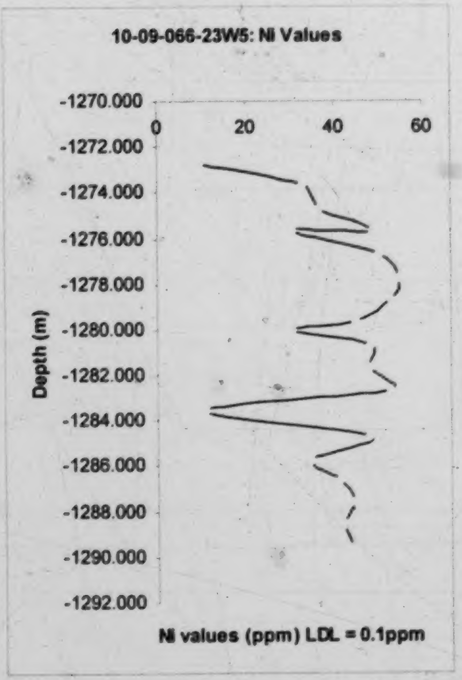




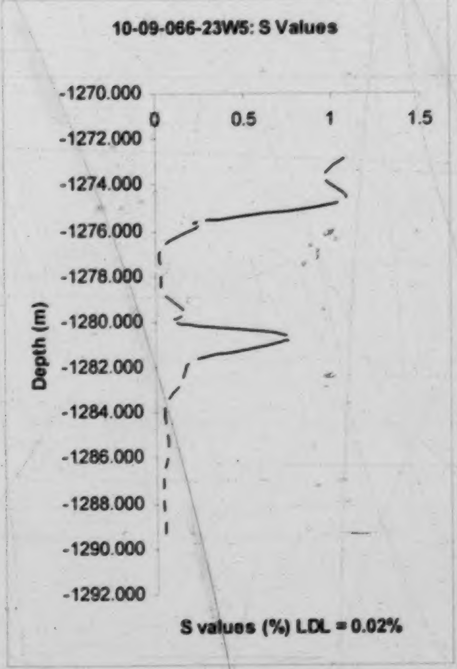
10-09-066-23W5: Fe Values



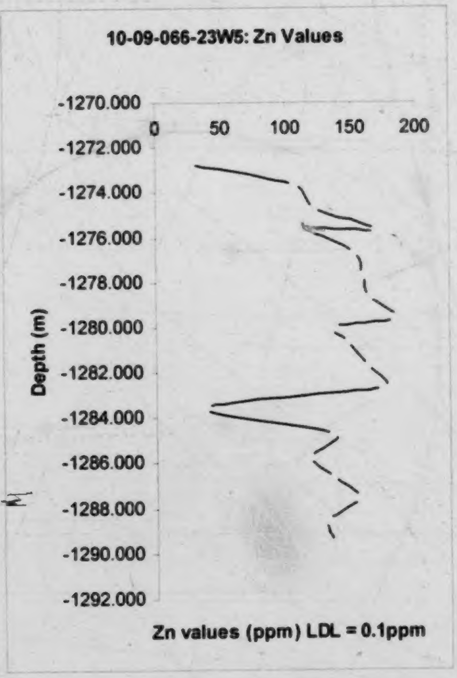
10-09-066-23W5: Mo Values

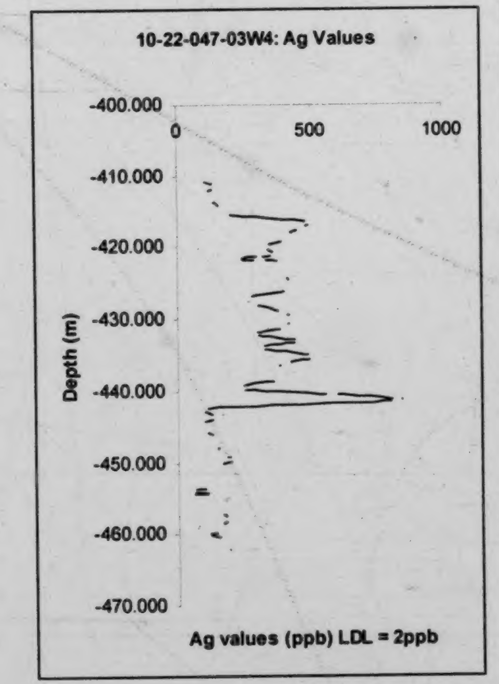


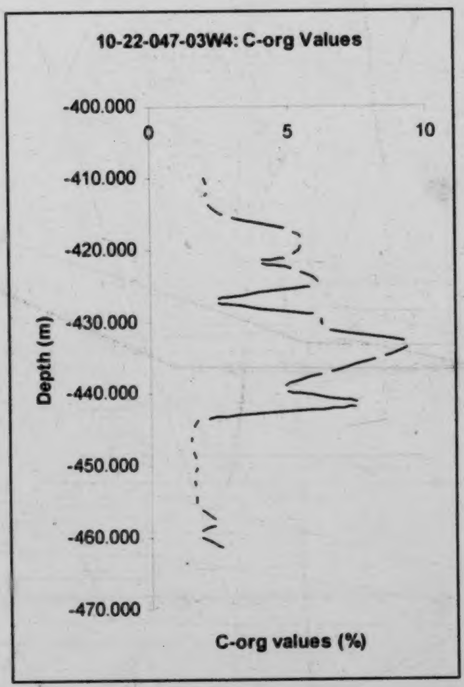
10-09-066-23W5: Ni Values

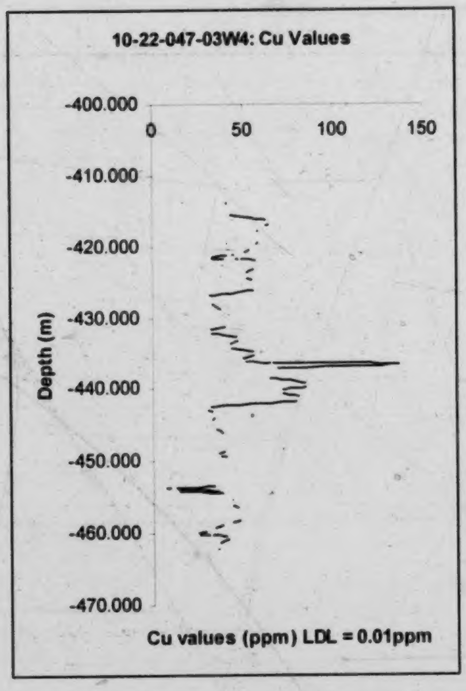


10-09-066-23W5: S Values

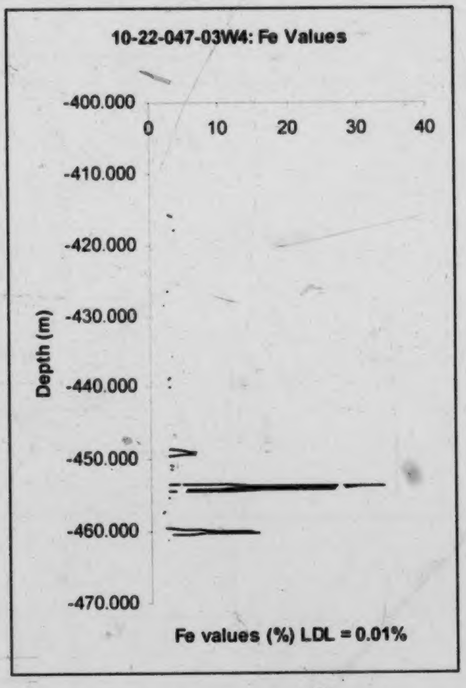

10-09-066-23W5: Zn Values
Depth (m)
-1270.000
-1272.000
-1274.000
-1276.000
-1278.000
-1280.000
-1282.000
-1284.000
-1286.000
-1288.000
-1290.000
-1292.000
0
50
100
150
200
Zn values (ppm) LDL = 0.1ppm


10-22-047-03W4: Ag Values
Depth (m)
-400.000
-410.000
-420.000
-430.000
-440.000
-450.000
-460.000
-470.000
0
500
1000
Ag values (ppb) LDL = 2ppb

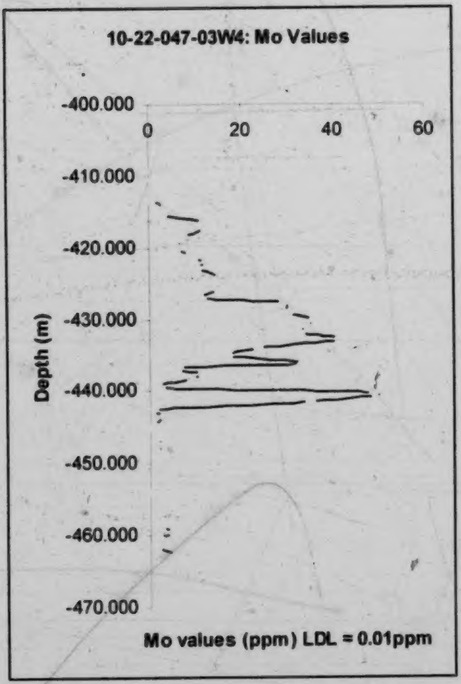

10-22-047-03W4: C-org Values
Depth (m)
-400.000
-410.000
-420.000
-430.000
-440.000
-450.000
-460.000
-470.000
0
5
10
C-org values (%)



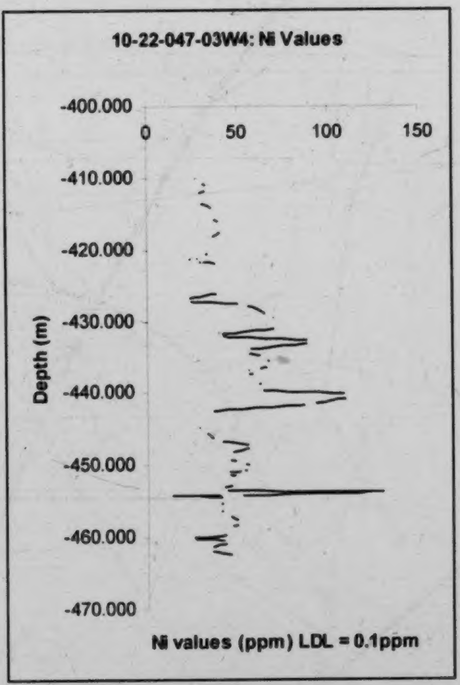
10-22-047-03W4: Cu Values
-400.000
-410.000
-420.000
-430.000
-440.000
-450.000
-460.000
-470.000
0
50
100
150
Depth (m)
Cu values (ppm) LDL = 0.01ppm



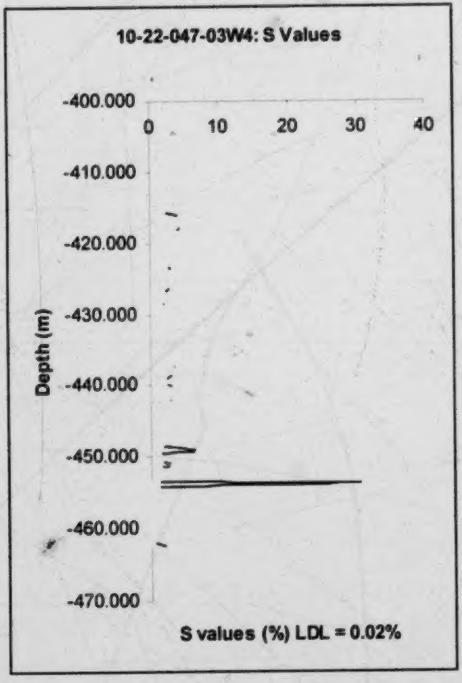
10-22-047-03W4: Fe Values
-400.000
-410.000
-420.000
-430.000
-440.000
-450.000
-460.000
-470.000
0
10
20
30
40
Depth (m)
Fe values (%) LDL = 0.01%

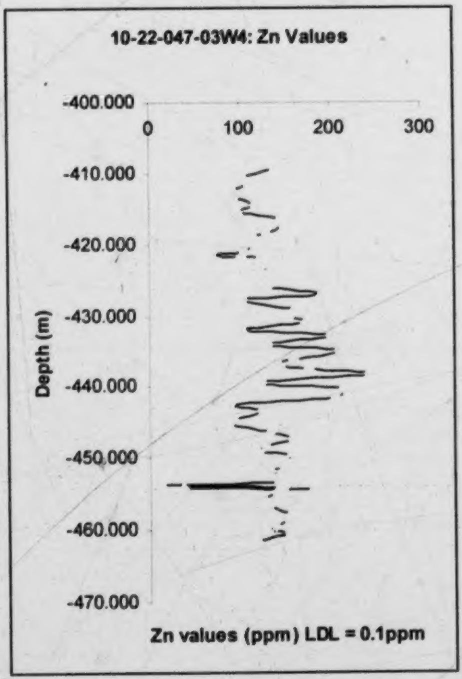


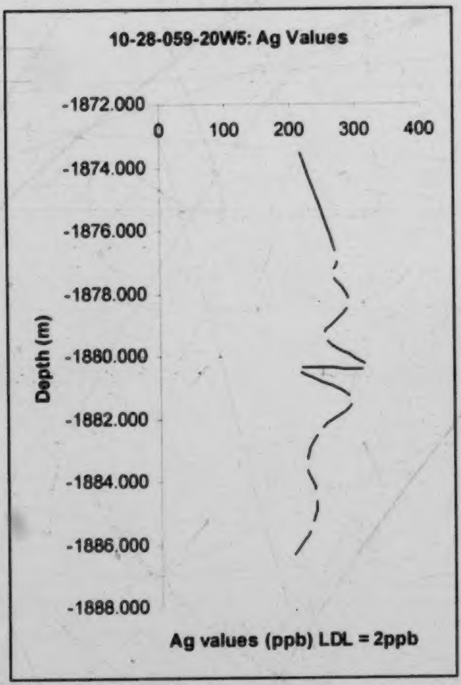
10-22-047-03W4: Mo Values
-400.000
-410.000
-420.000
-430.000
-440.000
-450.000
-460.000
-470.000
0
20
40
60
Depth (m)
Mo values (ppm) LDL = 0.01ppm

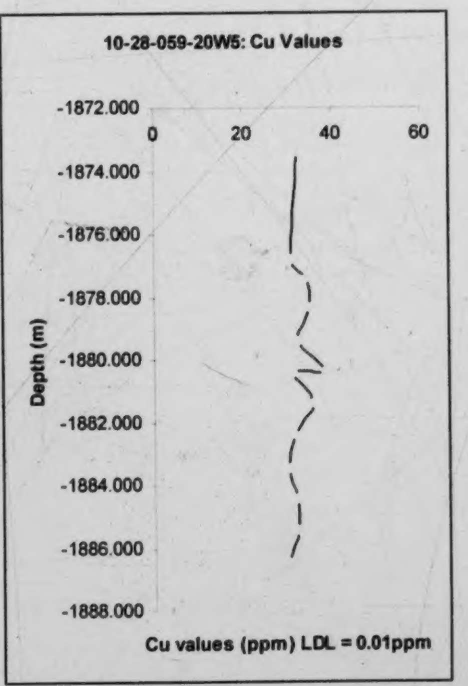


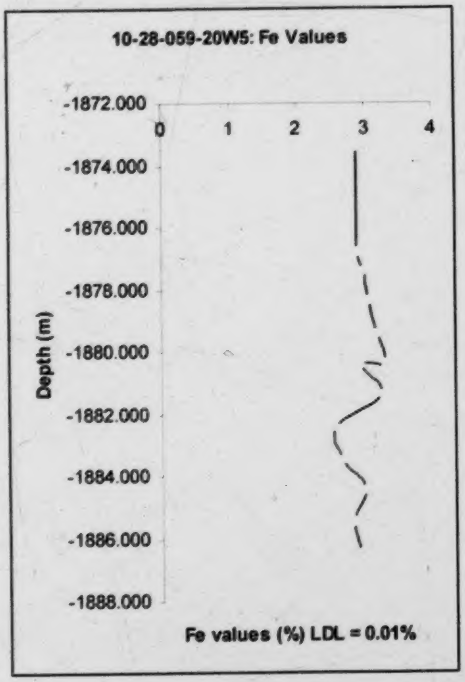
10-22-047-03W4: Ni Values
-400.000
-410.000
-420.000
-430.000
-440.000
-450.000
-460.000
-470.000
0
50
100
150
Depth (m)
Ni values (ppm) LDL = 0.1ppm

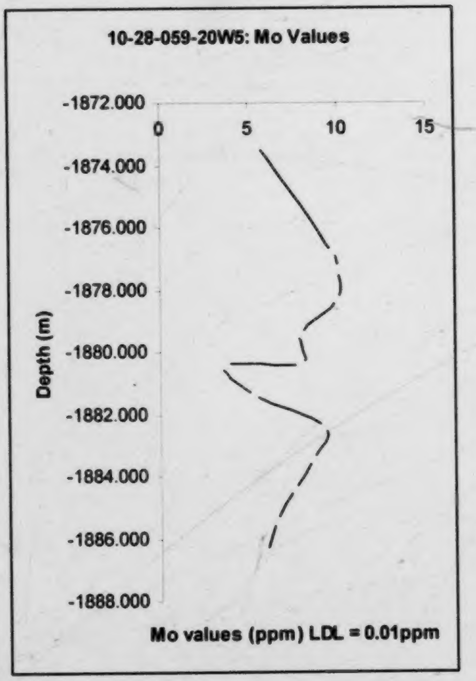

10-22-047-03W4: S Values
Depth (m)
-400.000
-410.000
-420.000
-430.000
-440.000
-450.000
-460.000
-470.000
0
10
20
30
40
S values (%) LDL = 0.02%

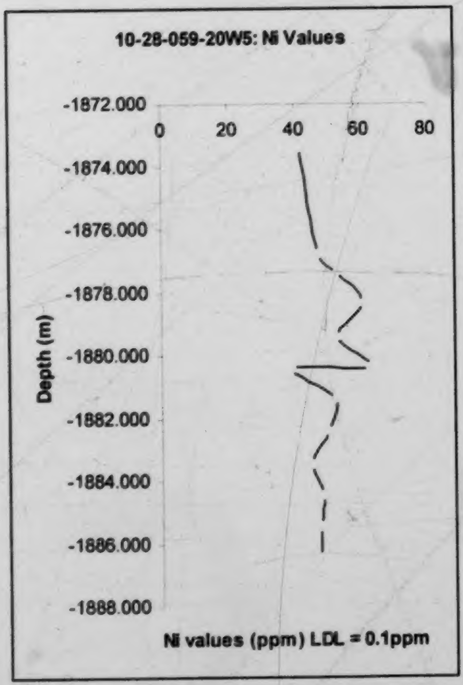

10-22-047-03W4: Zn Values
Depth (m)
-400.000
-410.000
-420.000
-430.000
-440.000
-450.000
-460.000
-470.000
0
100
200
300
Zn values (ppm) LDL = 0.1ppm

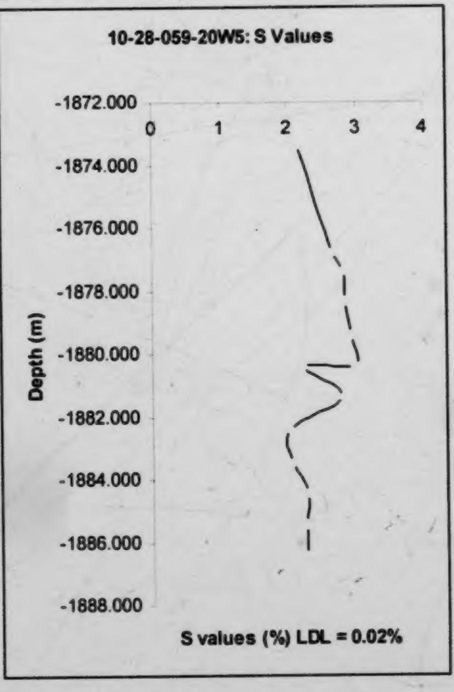

10-28-059-20W5: Ag Values
Depth (m)
-1872.000
-1874.000
-1876.000
-1878.000
-1880.000
-1882.000
-1884.000
-1886.000
-1888.000
0
100
200
300
400
Ag values (ppb) LDL = 2ppb

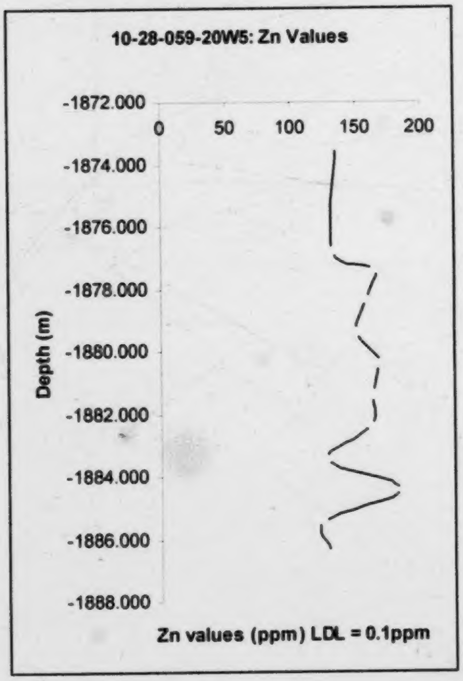

10-28-059-20W5: Cu Values
Depth (m)
-1872.000
-1874.000
-1876.000
-1878.000
-1880.000
-1882.000
-1884.000
-1886.000
-1888.000
0
20
40
60
Cu values (ppm) LDL = 0.01ppm


10-28-059-20W5: Fe Values
-1872.000
0
1
2
3
4
-1874.000
-1876.000
-1878.000
-1880.000
-1882.000
-1884.000
-1886.000
-1888.000
Depth (m)
Fe values (%) LDL = 0.01%


10-28-059-20W5: Mo Values
-1872.000
0
5
10
15
-1874.000
-1876.000
-1878.000
-1880.000
-1882.000
-1884.000
-1886.000
-1888.000
Depth (m)
Mo values (ppm) LDL = 0.01ppm

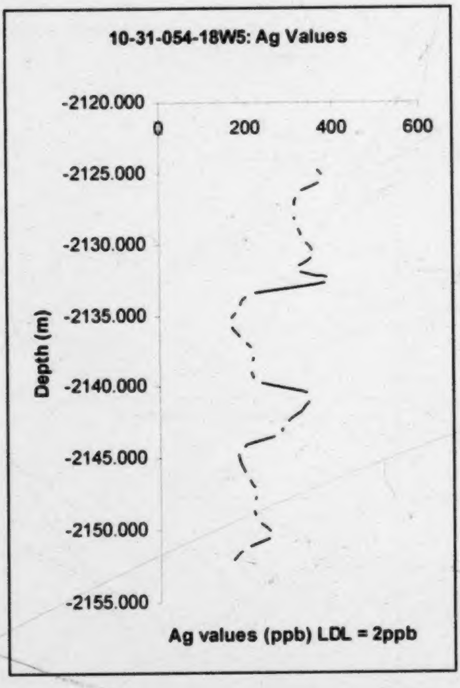

10-28-059-20W5: Ni Values
-1872.000
0
20
40
60
80
-1874.000
-1876.000
-1878.000
-1880.000
-1882.000
-1884.000
-1886.000
-1888.000
Depth (m)
Ni values (ppm) LDL = 0.1ppm

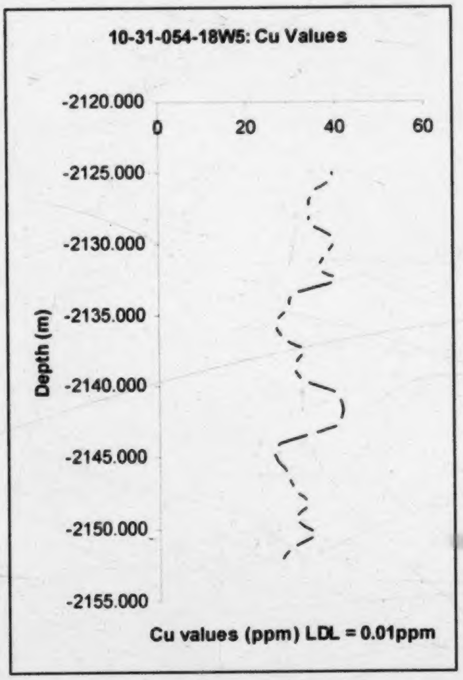

10-28-059-20W5: S Values
-1872.000
0
1
2
3
4
-1874.000
-1876.000
-1878.000
-1880.000
-1882.000
-1884.000
-1886.000
-1888.000
Depth (m)
S values (%) LDL = 0.02%

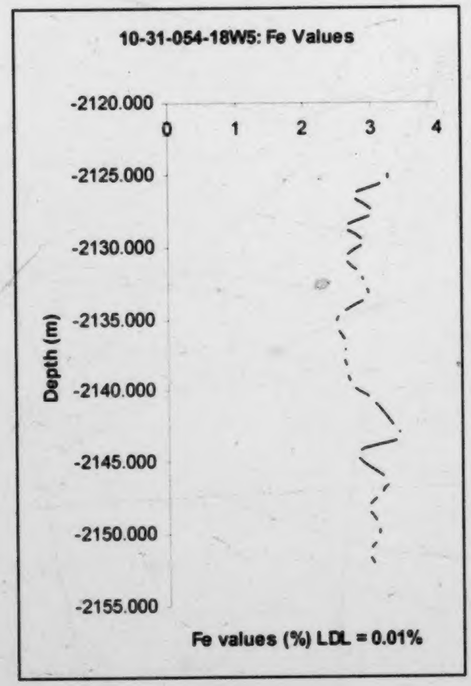


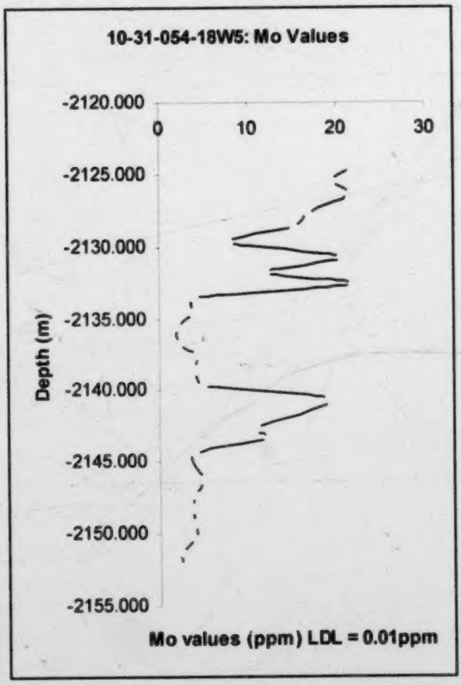
## 00/10-31-054-18W5/0

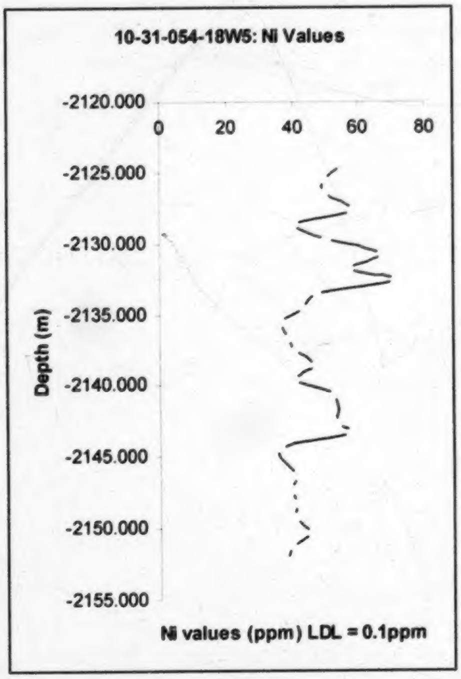
The core placement was based on geophysical log signatures. The core ranges from 2124 m to 2151.5 m depth, whereas the Second White Specks Formation interval ranges from 2037 m to 2075 m depth. The core therefore represents a unit that is stratigraphically below the Second White Specks Formation and may represent the Belle Fourche Formation or another underlying unit. It not analyzed here due to the lack of stratigraphic placement.

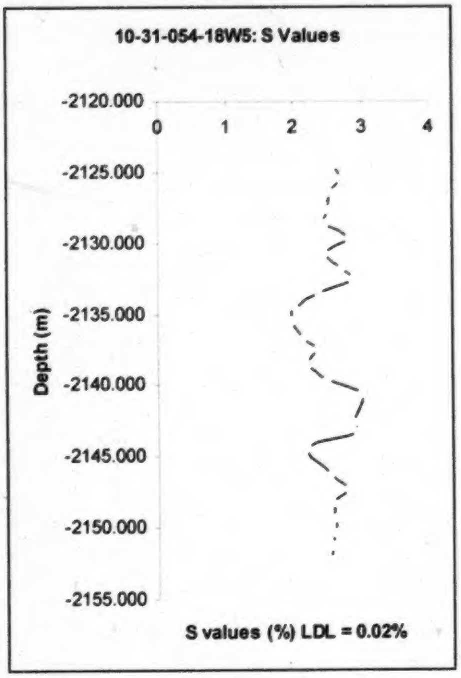

10-31-054-18W5: Ag Values
Depth (m)
-2120.000
-2125.000
-2130.000
-2135.000
-2140.000
-2145.000
-2150.000
-2155.000
0
200
400
600
Ag values (ppb) LDL = 2ppb

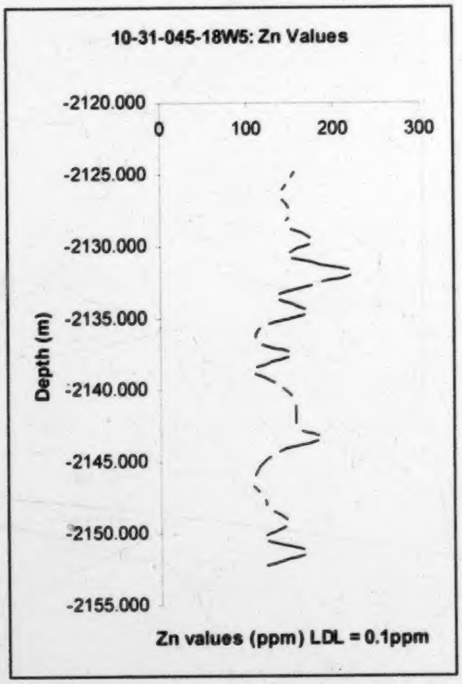

10-31-054-18W5: Cu Values
Depth (m)
-2120.000
-2125.000
-2130.000
-2135.000
-2140.000
-2145.000
-2150.000
-2155.000
0
20
40
60
Cu values (ppm) LDL = 0.01ppm

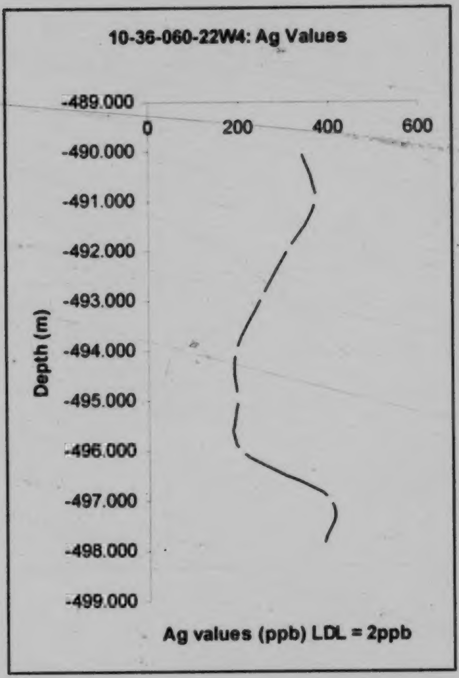

10-31-054-18W5: Fe Values
Depth (m)
-2120.000
-2125.000
-2130.000
-2135.000
-2140.000
-2145.000
-2150.000
-2155.000
0
1
2
3
4
Fe values (%) LDL = 0.01%

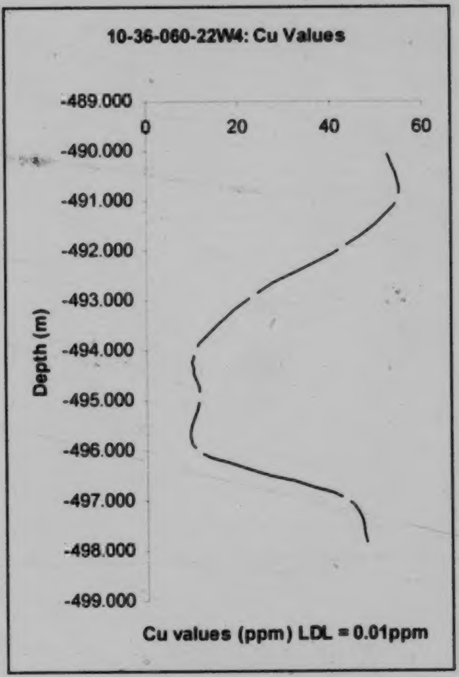

10-31-054-18W5: Mo Values
Depth (m)
-2120.000
-2125.000
-2130.000
-2135.000
-2140.000
-2145.000
-2150.000
-2155.000
0
10
20
30
Mo values (ppm) LDL = 0.01ppm

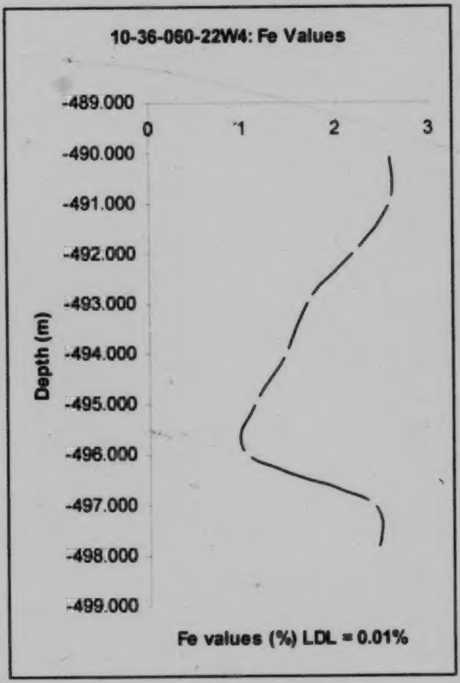

10-31-054-18W5: Ni Values
-2120.000
-2125.000
-2130.000
-2135.000
-2140.000
-2145.000
-2150.000
-2155.000
0
20
40
60
80
Depth (m)
Ni values (ppm) LDL = 0.1ppm

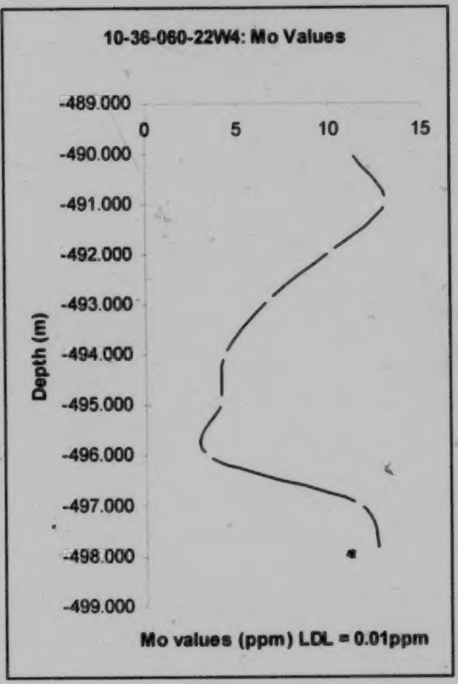

10-31-054-18W5: S Values
-2120.000
-2125.000
-2130.000
-2135.000
-2140.000
-2145.000
-2150.000
-2155.000
0
1
2
3
4
Depth (m)
S values (%) LDL = 0.02%

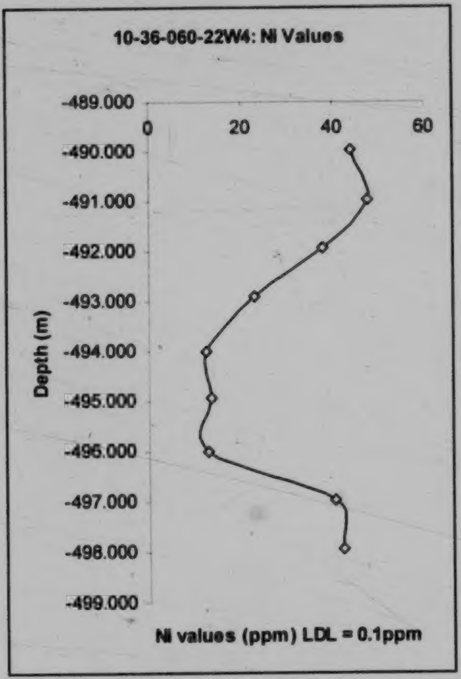

10-31-045-18W5: Zn Values
-2120.000
-2125.000
-2130.000
-2135.000
-2140.000
-2145.000
-2150.000
-2155.000
0
100
200
300
Depth (m)
Zn values (ppm) LDL = 0.1ppm

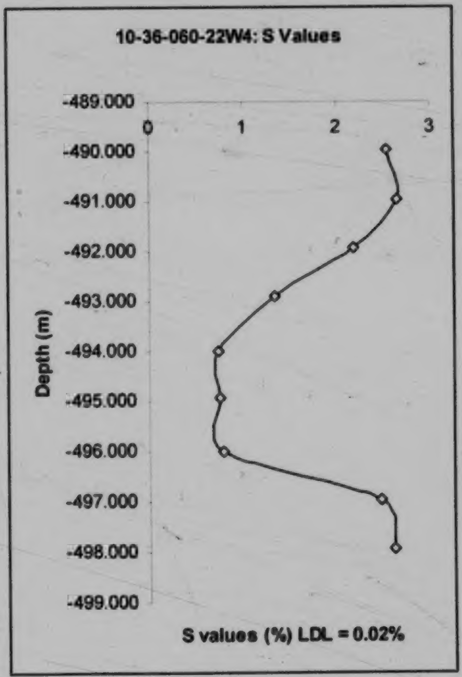

10-36-060-22W4: Ag Values
-489.000
-490.000
-491.000
-492.000
-493.000
-494.000
-495.000
-496.000
-497.000
-498.000
-499.000
0
200
400
600
Depth (m)
Ag values (ppb) LDL = 2ppb

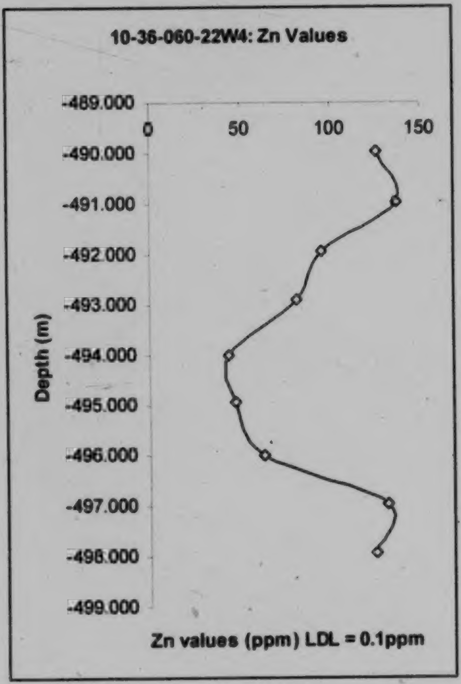

10-36-060-22W4: Cu Values
-489.000
-490.000
-491.000
-492.000
-493.000
-494.000
-495.000
-496.000
-497.000
-498.000
-499.000
0
20
40
60
Depth (m)
Cu values (ppm) LDL = 0.01ppm


10-36-060-22W4: Fe Values
-489.000
-490.000
-491.000
-492.000
-493.000
-494.000
-495.000
-496.000
-497.000
-498.000
-499.000
0
1
2
3
Depth (m)
Fe values (%) LDL = 0.01%


10-36-060-22W4: Mo Values
-489.000
-490.000
-491.000
-492.000
-493.000
-494.000
-495.000
-496.000
-497.000
-498.000
-499.000
0
5
10
15
Depth (m)
Mo values (ppm) LDL = 0.01ppm

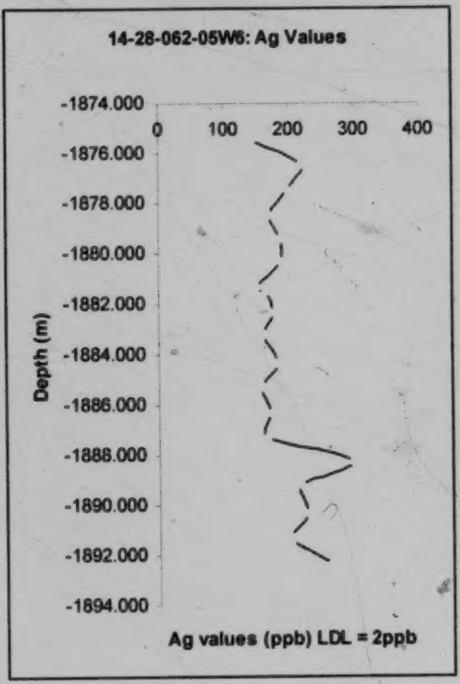

10-36-060-22W4: Ni Values
Depth (m)
-489.000
-490.000
-491.000
-492.000
-493.000
-494.000
-495.000
-496.000
-497.000
-498.000
-499.000
0
20
40
60
Ni values (ppm) LDL = 0.1ppm

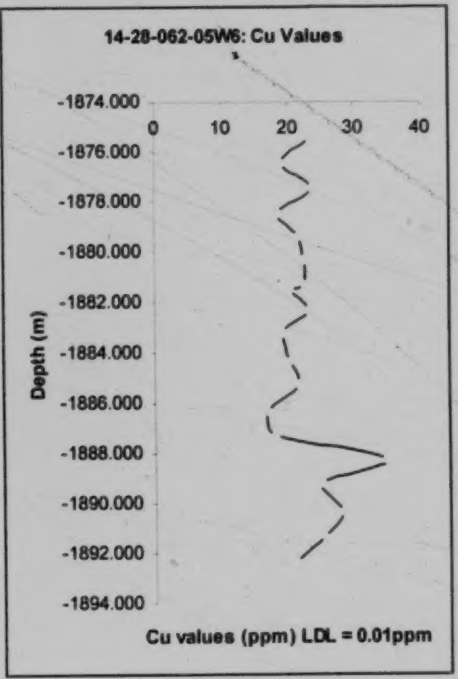

10-36-060-22W4: S Values
Depth (m)
-489.000
-490.000
-491.000
-492.000
-493.000
-494.000
-495.000
-496.000
-497.000
-498.000
-499.000
0
1
2
3
S values (%) LDL = 0.02%

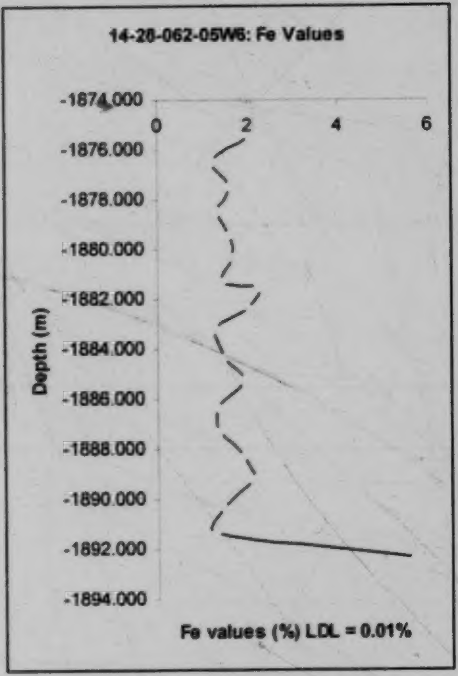

10-36-060-22W4: Zn Values
Depth (m)
-489.000
-490.000
-491.000
-492.000
-493.000
-494.000
-495.000
-496.000
-497.000
-498.000
-499.000
0
50
100
150
Zn values (ppm) LDL = 0.1ppm

00/14-28-062-05W6

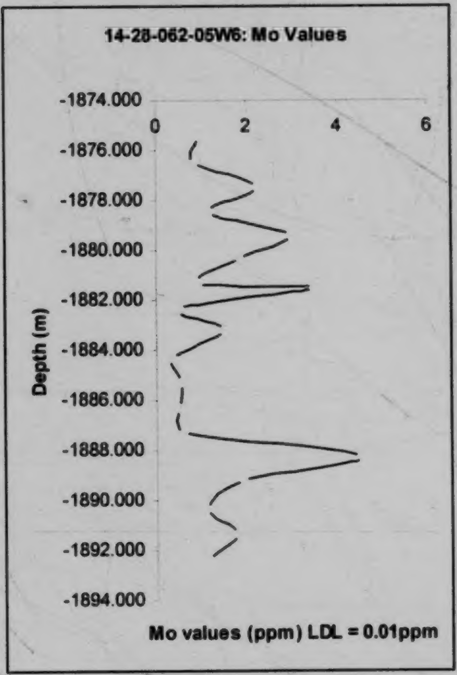
The core placement could not be done with certainty using any of geophysical logs, micropaleontology or lithology. The core interval ranges from 1875 m to 1893 m, but the range for the Second White Specks Formation could not be determined. It is not analyzed here due to the lack of stratigraphic placement.



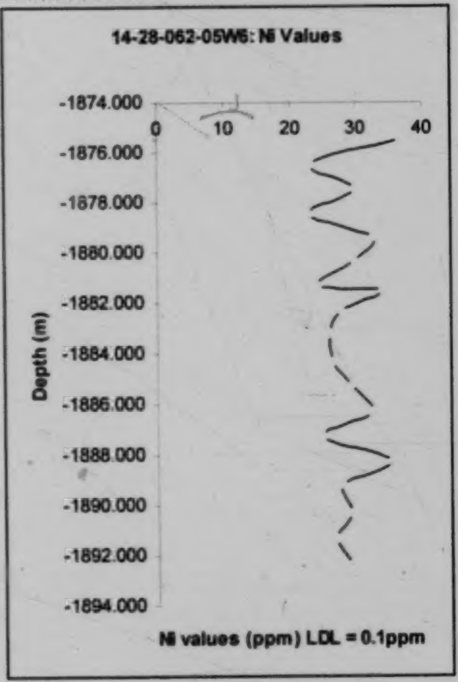




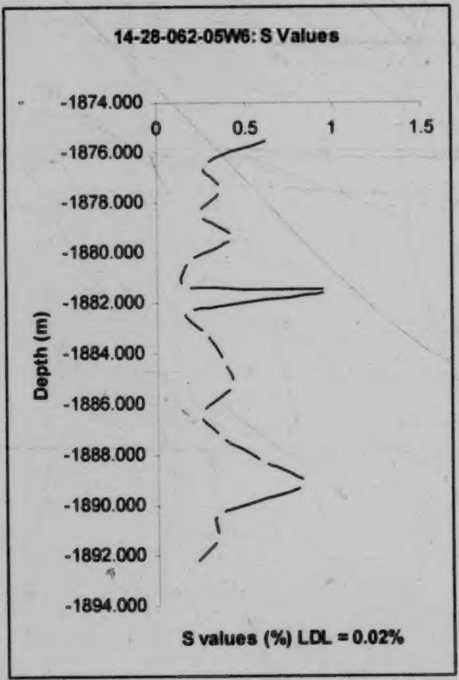
14-28-062-05W6: Fe Values



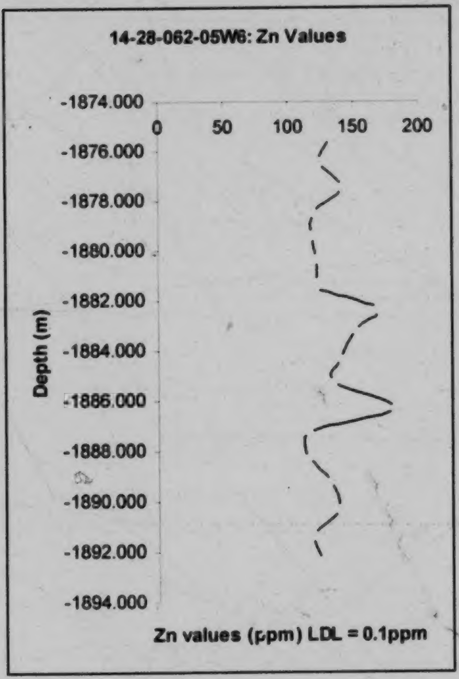
14-28-062-05W6: Mo Values



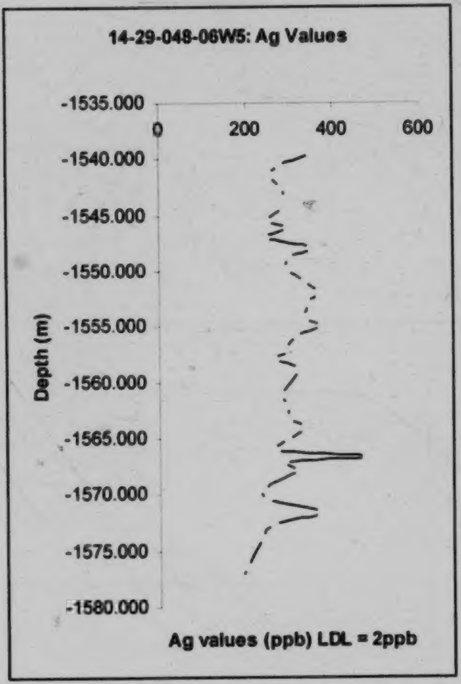
14-28-062-05W6: Ni Values



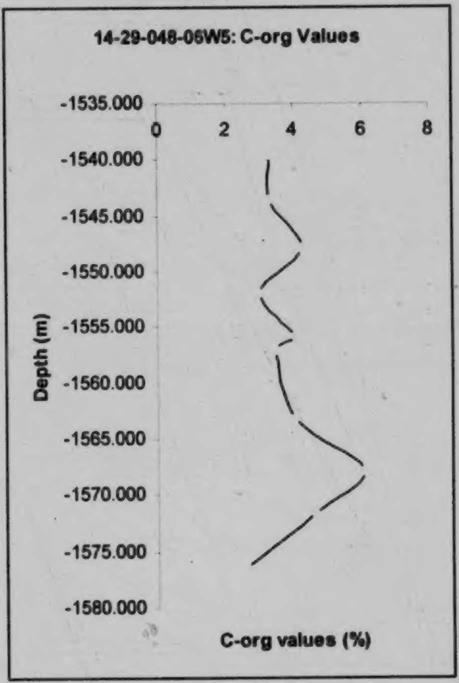
14-28-062-05W6: S Values



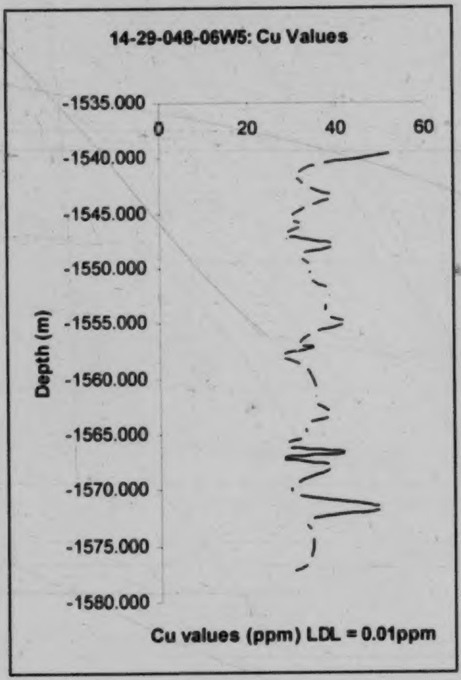
14-28-062-05W6: Zn Values

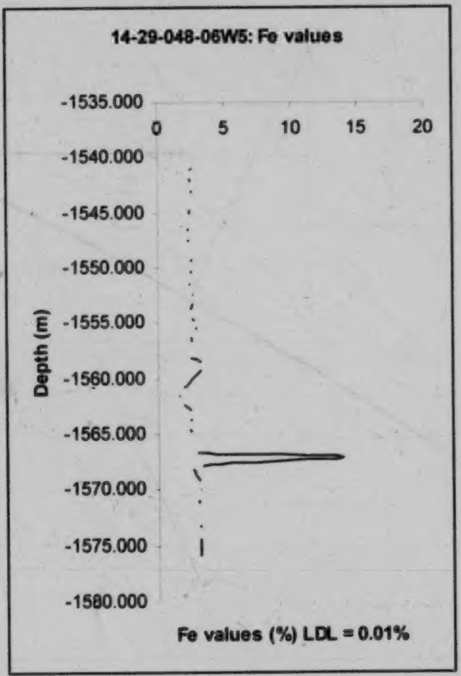


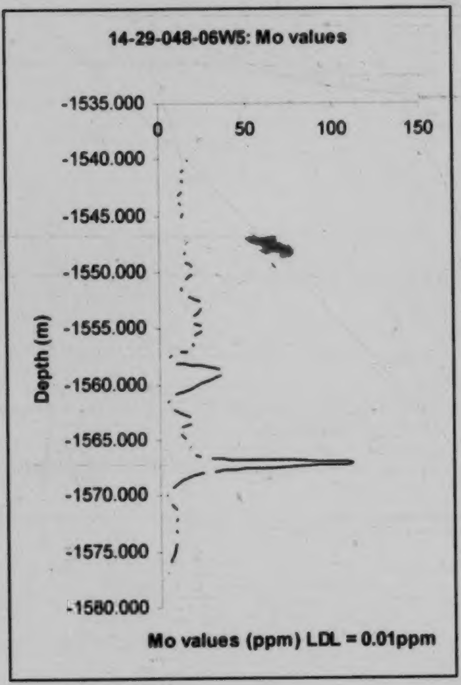
14-29-048-06W5: Ag Values

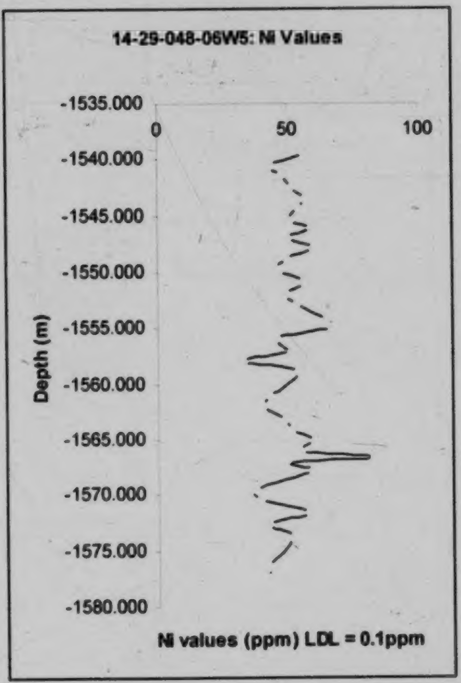


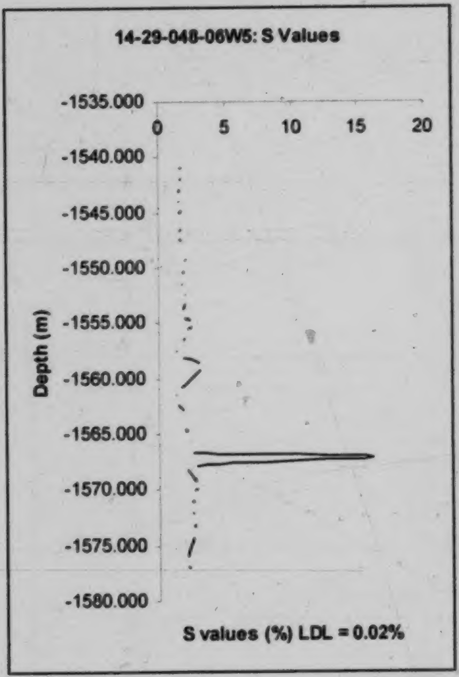
14-29-048-06W5: C-org Values

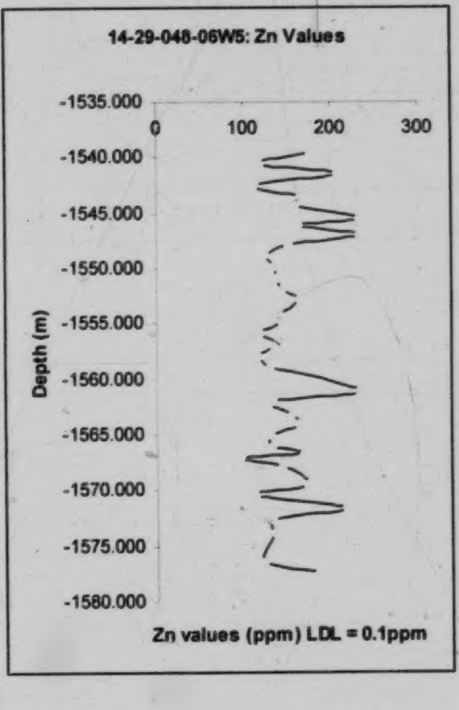

14-29-048-06W5: Cu Values
Depth (m)
-1535.000
-1540.000
-1545.000
-1550.000
-1555.000
-1560.000
-1565.000
-1570.000
-1575.000
-1580.000
0
20
40
60
Cu values (ppm) LDL = 0.01ppm


14-29-048-06W5: Fe values
Depth (m)
-1535.000
-1540.000
-1545.000
-1550.000
-1555.000
-1560.000
-1565.000
-1570.000
-1575.000
-1580.000
0
5
10
15
20
Fe values (%) LDL = 0.01%


14-29-048-06W5: Mo values
Depth (m)
-1535.000
-1540.000
-1545.000
-1550.000
-1555.000
-1560.000
-1565.000
-1570.000
-1575.000
-1580.000
0
50
100
150
Mo values (ppm) LDL = 0.01ppm

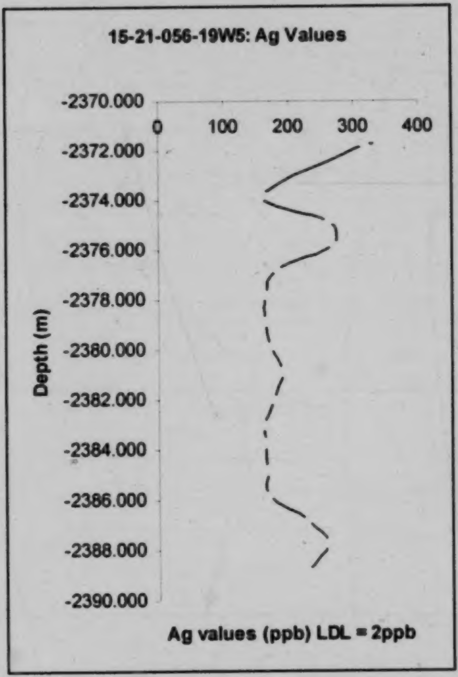

14-29-048-06W5: Ni Values
Depth (m)
-1535.000
-1540.000
-1545.000
-1550.000
-1555.000
-1560.000
-1565.000
-1570.000
-1575.000
-1580.000
0
50
100
Ni values (ppm) LDL = 0.1ppm

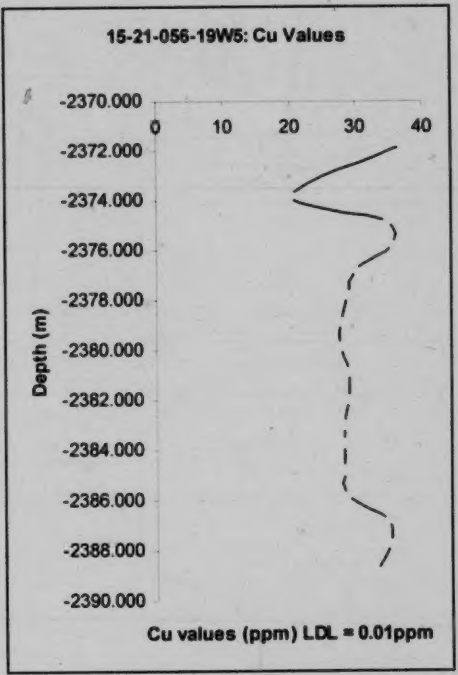


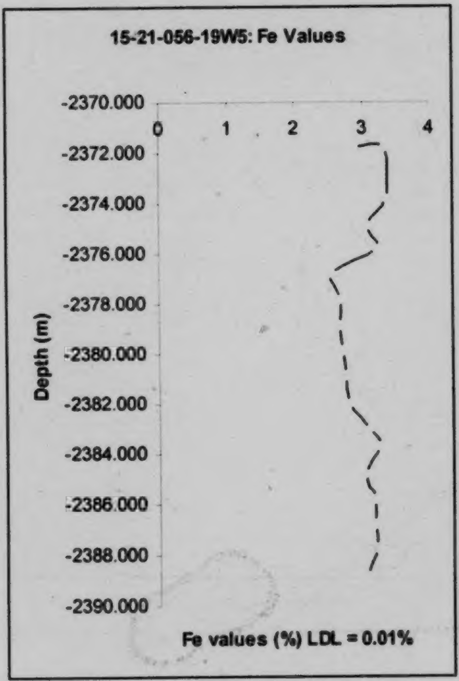


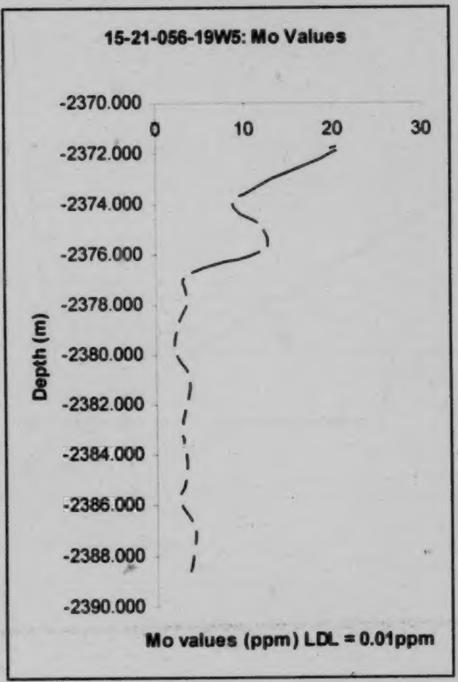
00/15-21-056-19W5/0

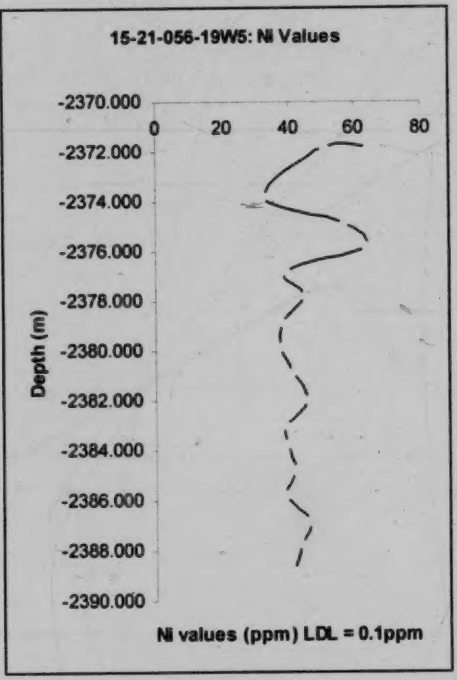
The core placement could not be made with certainty using any of geophysical logs, micropaleontology or lithology. The core ranges from 2371.23 m to 2389.52 m depth and the interval of the Second White Specks Formation could not be confirmed. It is not analyzed here due to the lack of stratigraphic placement.

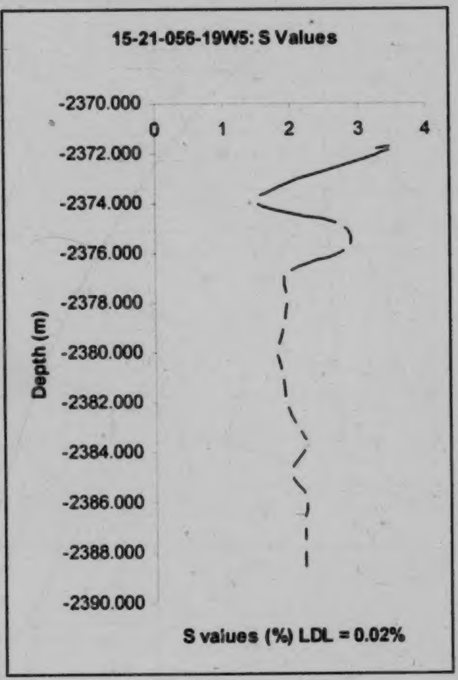

15-21-056-19W5: Ag Values
-2370.000
-2372.000
-2374.000
-2376.000
-2378.000
-2380.000
-2382.000
-2384.000
-2386.000
-2388.000
-2390.000
0
100
200
300
400
Depth (m)
Ag values (ppb) LDL = 2ppb

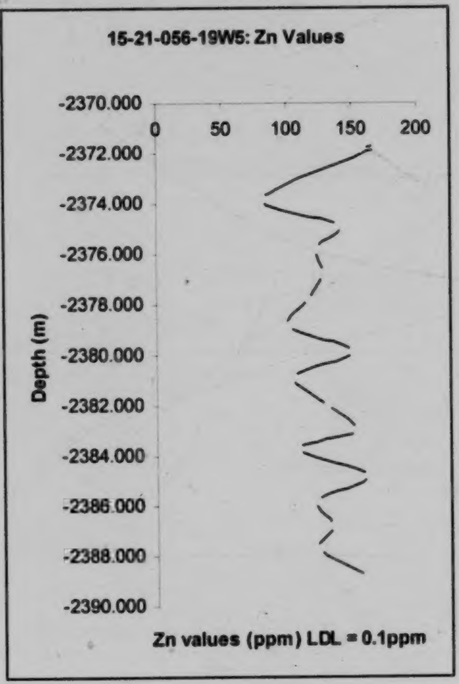

15-21-056-19W5: Cu Values
-2370.000
-2372.000
-2374.000
-2376.000
-2378.000
-2380.000
-2382.000
-2384.000
-2386.000
-2388.000
-2390.000
0
10
20
30
40
Depth (m)
Cu values (ppm) LDL = 0.01ppm

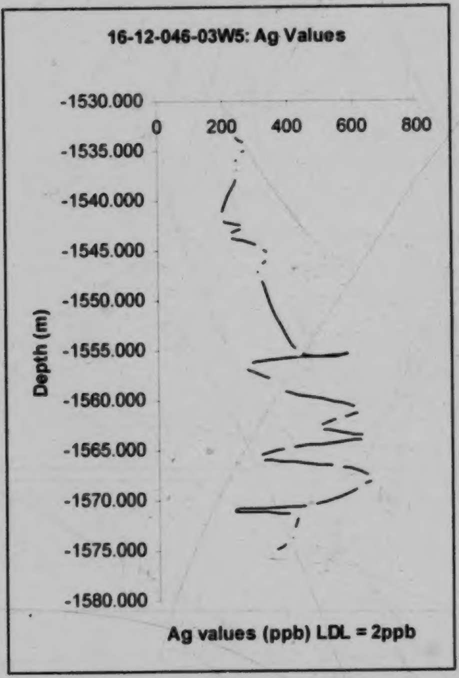

15-21-056-19W5: Fe Values
-2370.000
-2372.000
-2374.000
-2376.000
-2378.000
-2380.000
-2382.000
-2384.000
-2386.000
-2388.000
-2390.000
0
1
2
3
4
Depth (m)
Fe values (%) LDL = 0.01%

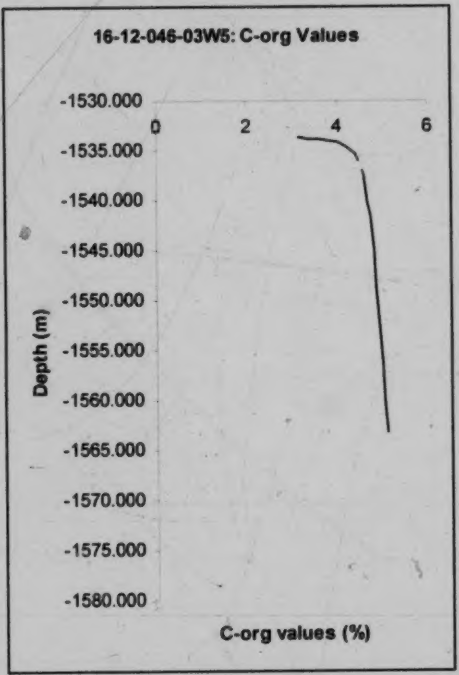

15-21-056-19W5: Mo Values
-2370.000
-2372.000
-2374.000
-2376.000
-2378.000
-2380.000
-2382.000
-2384.000
-2386.000
-2388.000
-2390.000
0
10
20
30
Depth (m)
Mo values (ppm) LDL = 0.01ppm

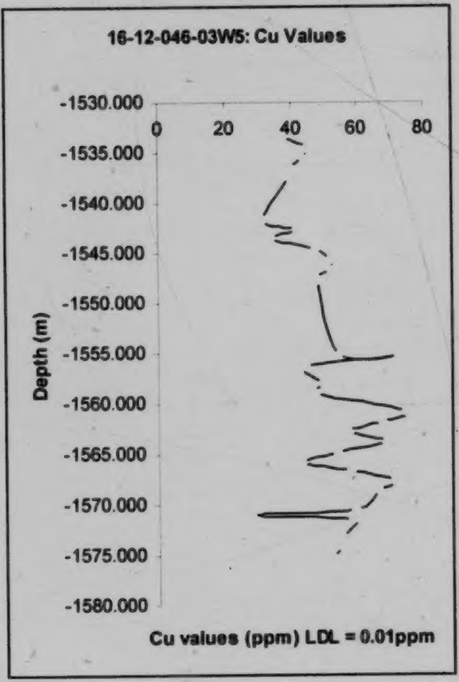

15-21-056-19W5: Ni Values
Depth (m)
-2370.000
-2372.000
-2374.000
-2376.000
-2378.000
-2380.000
-2382.000
-2384.000
-2386.000
-2388.000
-2390.000
0
20
40
60
80
Ni values (ppm) LDL = 0.1ppm

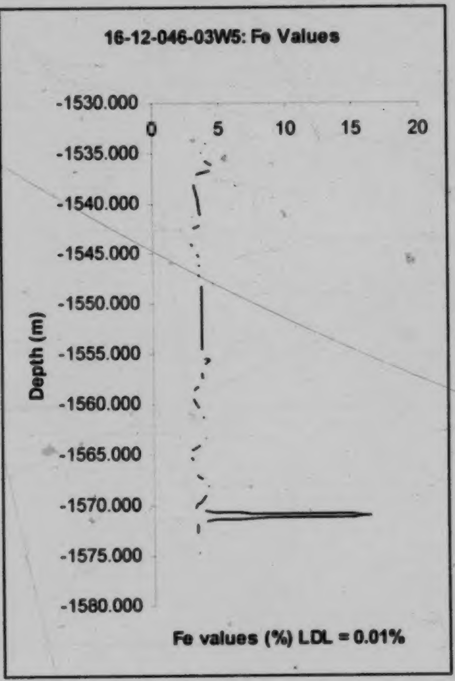

15-21-056-19W5: S Values
Depth (m)
-2370.000
-2372.000
-2374.000
-2376.000
-2378.000
-2380.000
-2382.000
-2384.000
-2386.000
-2388.000
-2390.000
0
1
2
3
4
S values (%) LDL = 0.02%

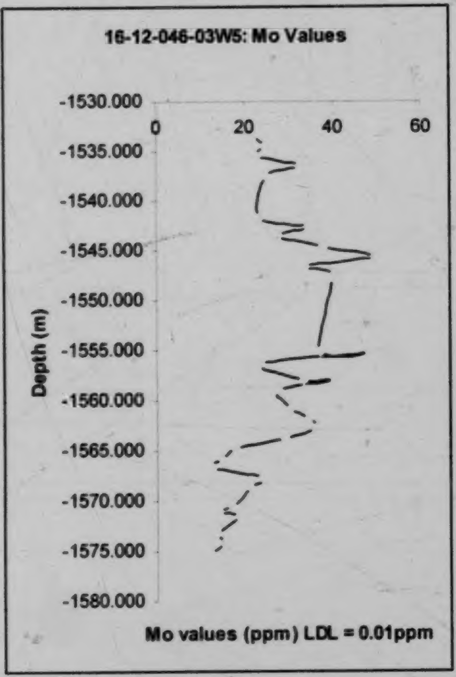

15-21-056-19W5: Zn Values
Depth (m)
-2370.000
-2372.000
-2374.000
-2376.000
-2378.000
-2380.000
-2382.000
-2384.000
-2386.000
-2388.000
-2390.000
0
50
100
150
200
Zn values (ppm) LDL = 0.1ppm

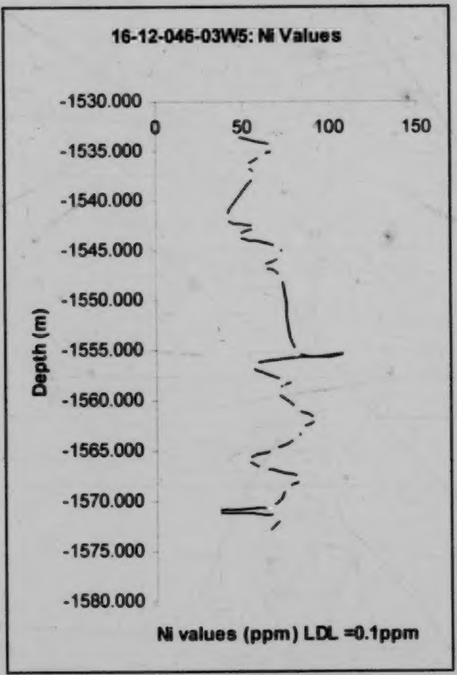

16-12-046-03W5: Ag Values

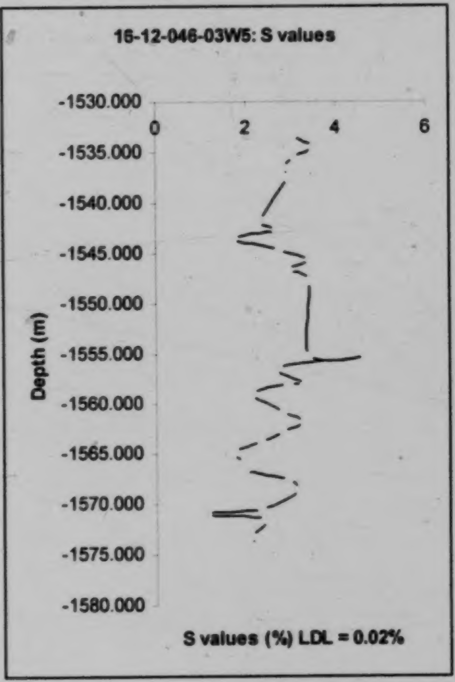

16-12-046-03W5: C-org Values

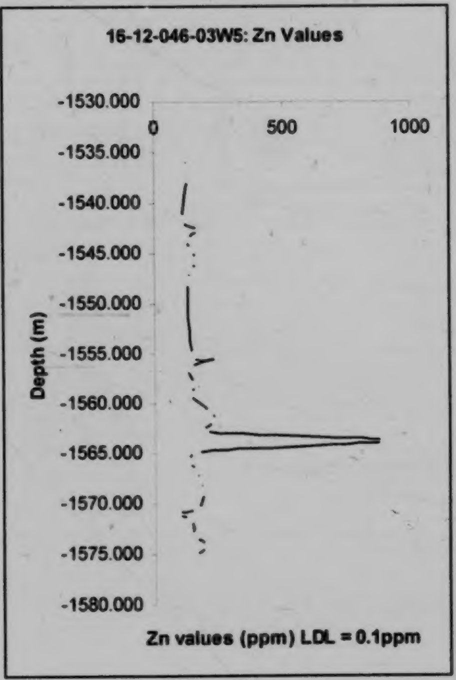

16-12-046-03W5: Cu Values


16-12-046-03W5: Fe Values


16-12-046-03W5: Mo Values

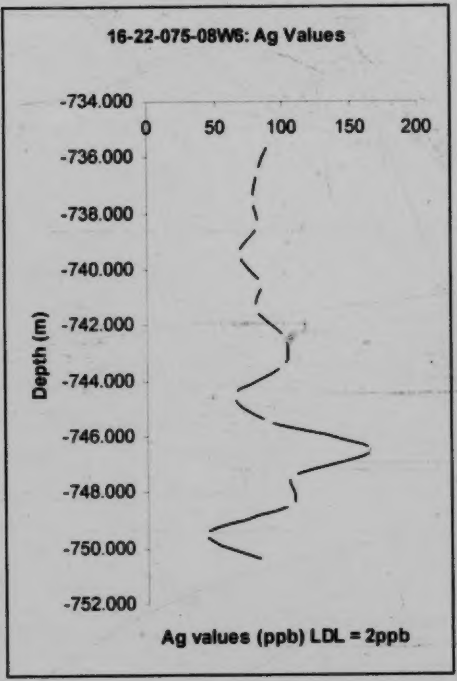

16-12-046-03W5: Ni Values

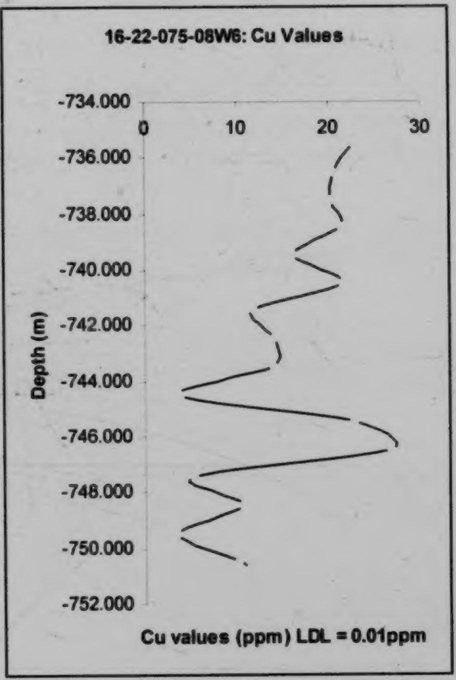

16-12-046-03W5: S values

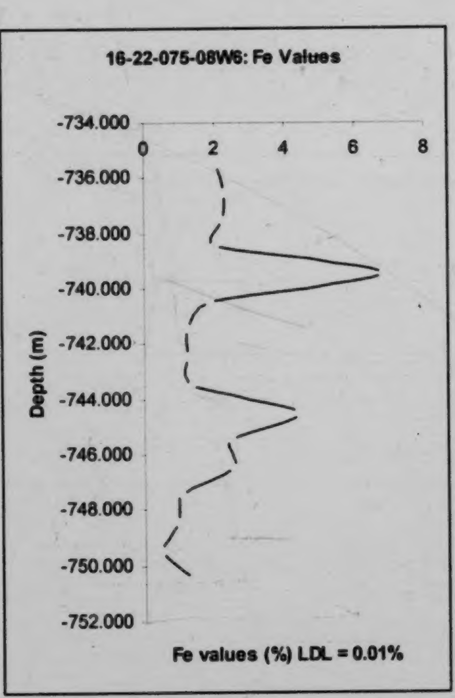

16-12-046-03W5: Zn Values

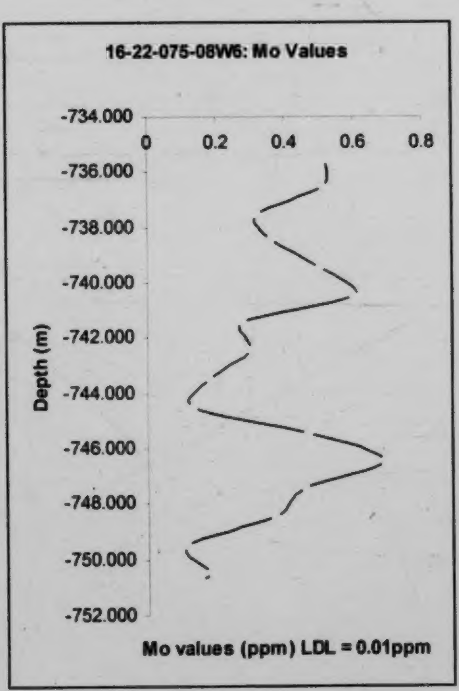
00/16-22-075-08W6/0

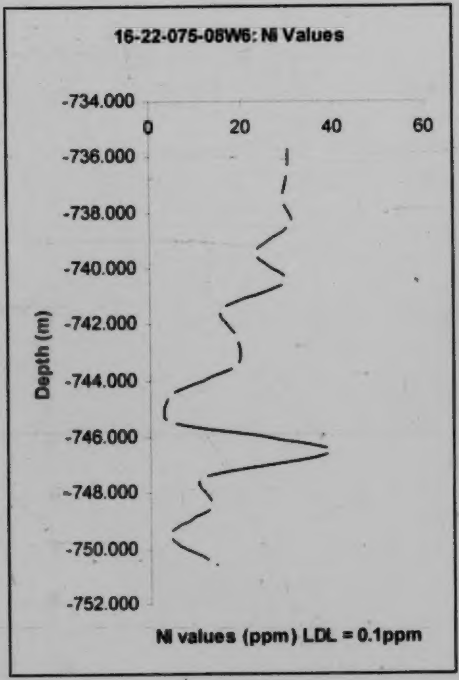
The core placement could not be made with certainty using any of geophysical logs, micropaleontology or lithology. The core interval ranges from 735 m to 752.1 m, but the range for the Second White Specks Formation could not be determined. The core may represent an underlying formation, but could not be confirmed. It is not analyzed here due to the lack of stratigraphic placement.

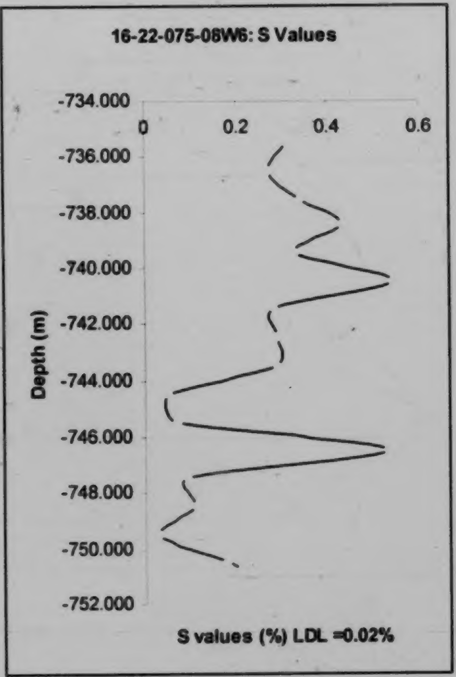


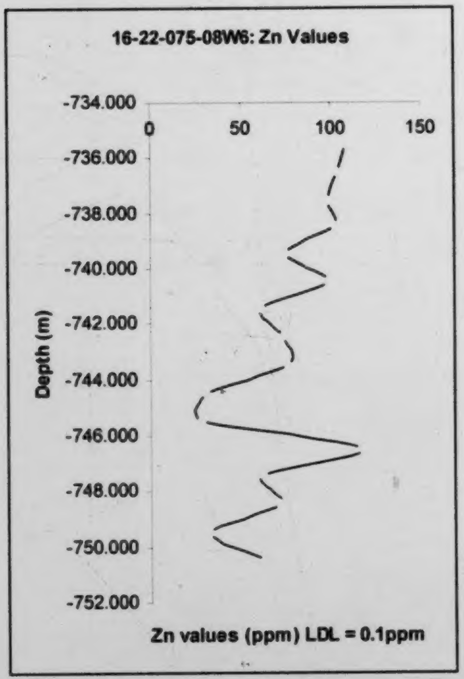


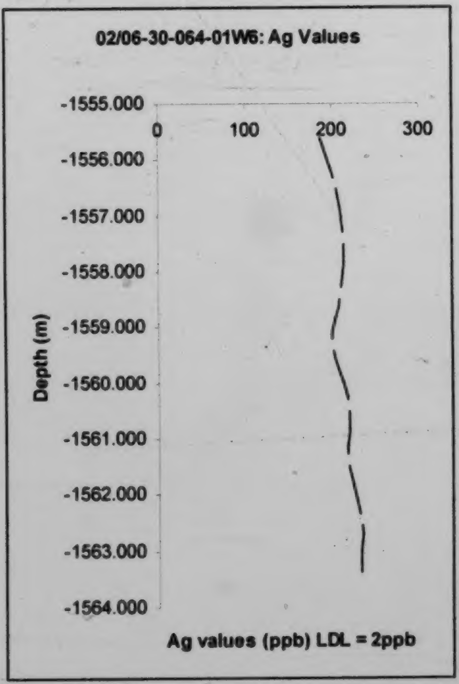

16-22-075-08W6: Fe Values
-734.000
-736.000
-738.000
-740.000
-742.000
-744.000
-746.000
-748.000
-750.000
-752.000
0
2
4
6
8
Depth (m)
Fe values (%) LDL = 0.01%

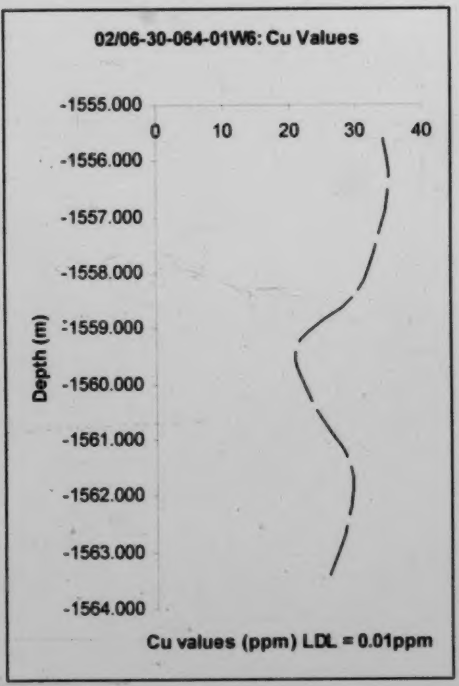

16-22-075-08W6: Mo Values
-734.000
-736.000
-738.000
-740.000
-742.000
-744.000
-746.000
-748.000
-750.000
-752.000
0
0.2
0.4
0.6
0.8
Depth (m)
Mo values (ppm) LDL = 0.01ppm

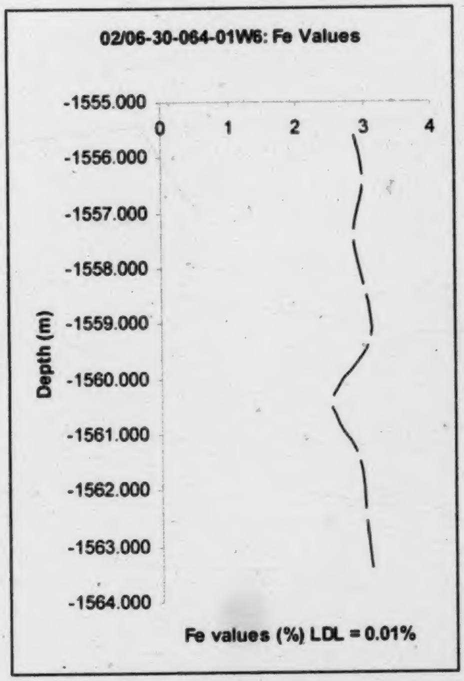

16-22-075-08W6: Ni Values
-734.000
-736.000
-738.000
-740.000
-742.000
-744.000
-746.000
-748.000
-750.000
-752.000
0
20
40
60
Depth (m)
Ni values (ppm) LDL = 0.1ppm

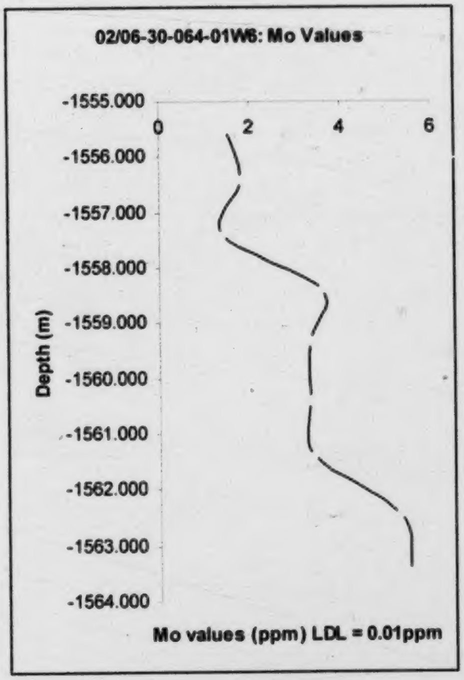

16-22-075-08W6: S Values
-734.000
-736.000
-738.000
-740.000
-742.000
-744.000
-746.000
-748.000
-750.000
-752.000
0
0.2
0.4
0.6
Depth (m)
S values (%) LDL =0.02%

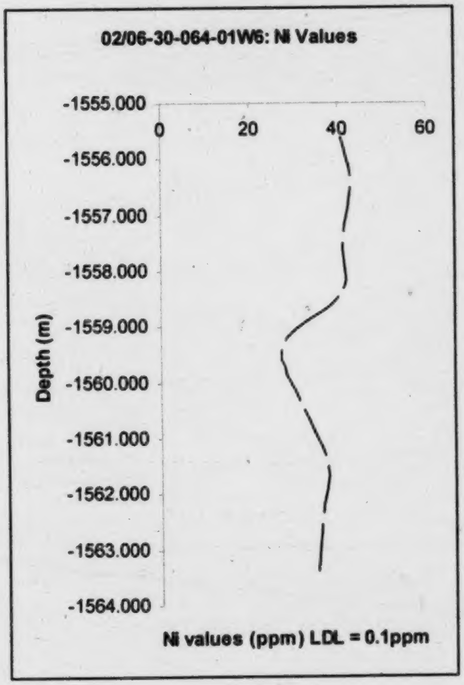

16-22-075-08W6: Zn Values
-734.000
-736.000
-738.000
-740.000
-742.000
-744.000
-746.000
-748.000
-750.000
-752.000
0
50
100
150
Depth (m)
Zn values (ppm) LDL = 0.1ppm

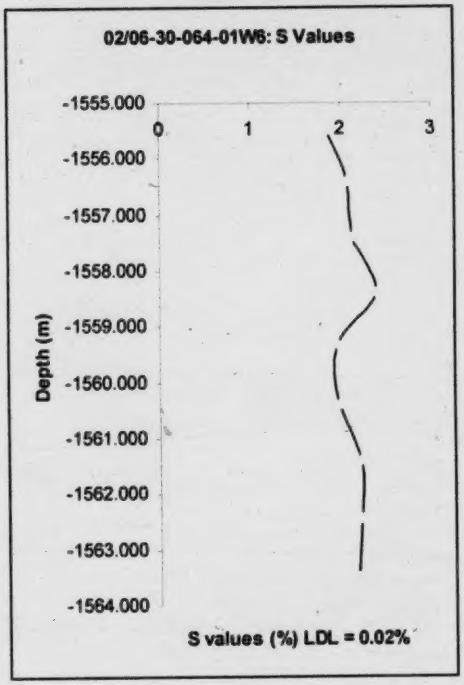

02/06-30-064-01W6: Ag Values
-1555.000
-1556.000
-1557.000
-1558.000
-1559.000
-1560.000
-1561.000
-1562.000
-1563.000
-1564.000
0
100
200
300
Depth (m)
Ag values (ppb) LDL = 2ppb

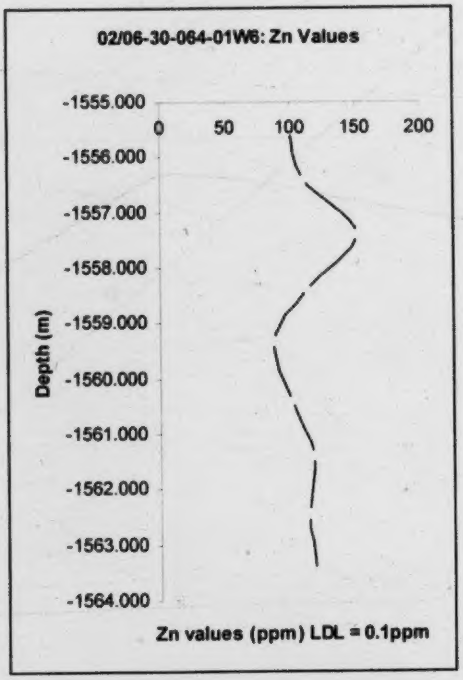

02/06-30-064-01W6: Cu Values
-1555.000
-1556.000
-1557.000
-1558.000
-1559.000
-1560.000
-1561.000
-1562.000
-1563.000
-1564.000
0
10
20
30
40
Depth (m)
Cu values (ppm) LDL = 0.01ppm

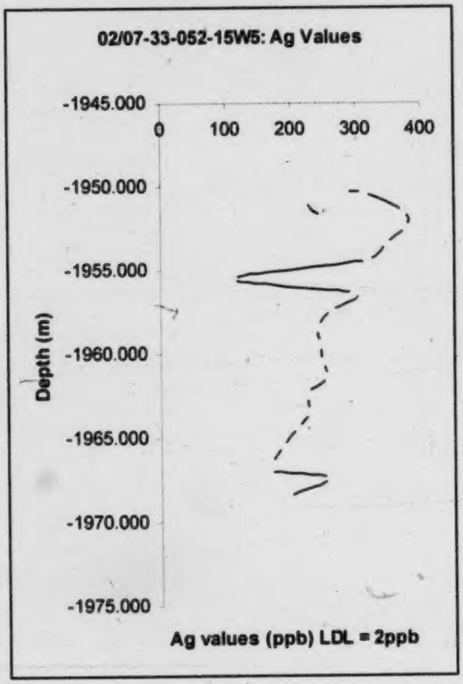

02/06-30-064-01W6: Fe Values

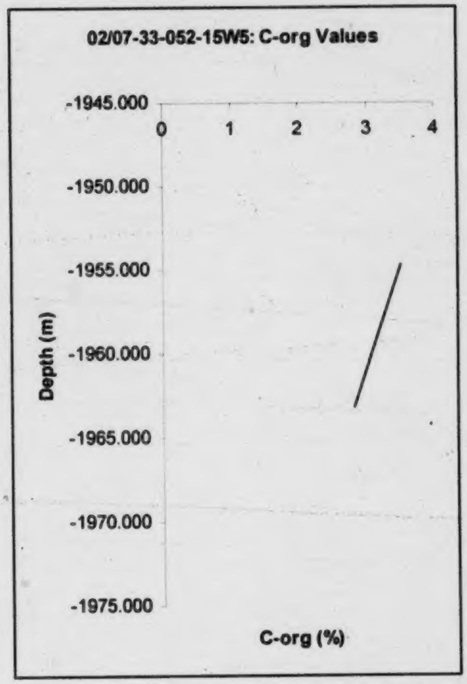

02/06-30-064-01W6: Mo Values

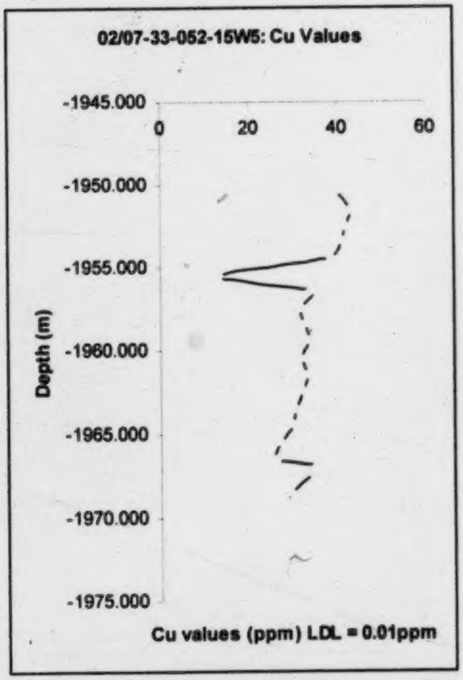

02/06-30-064-01W6: Ni Values

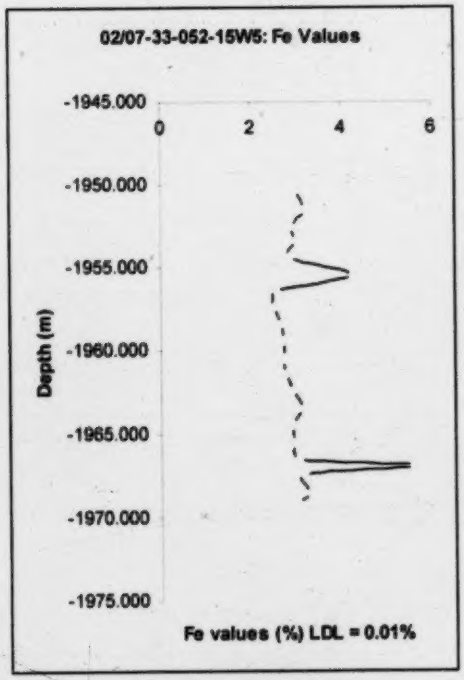

02/06-30-064-01W6: S Values

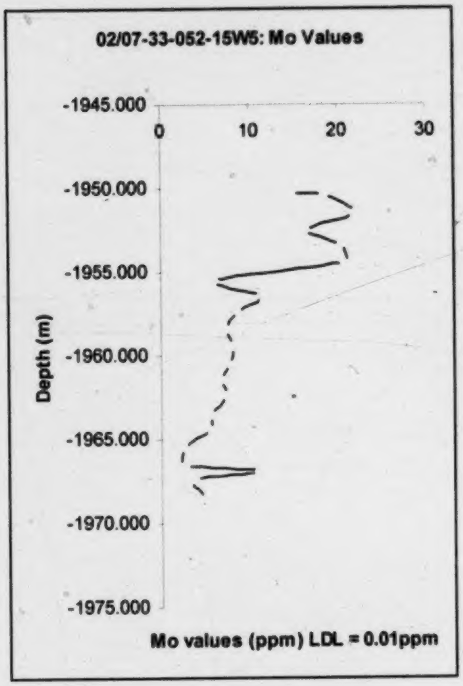

02/06-30-064-01W6: Zn Values
-1555.000
-1556.000
-1557.000
-1558.000
-1559.000
-1560.000
-1561.000
-1562.000
-1563.000
-1564.000
0
50
100
150
200
Depth (m)
Zn values (ppm) LDL = 0.1ppm

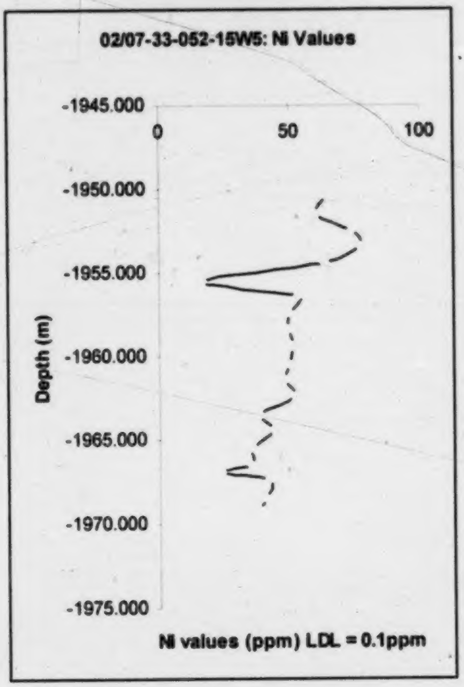

02/07-33-052-15W5: Ag Values
-1945.000
-1950.000
-1955.000
-1960.000
-1965.000
-1970.000
-1975.000
0
100
200
300
400
Depth (m)
Ag values (ppb) LDL = 2ppb

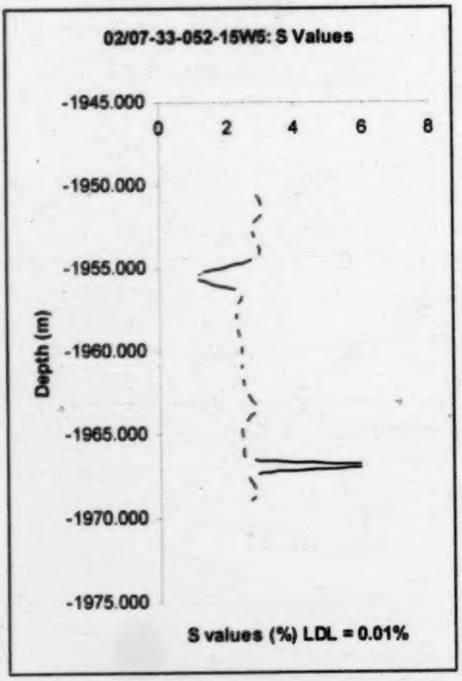

02/07-33-052-15W5: C-org Values
-1945.000
-1950.000
-1955.000
-1960.000
-1965.000
-1970.000
-1975.000
0
1
2
3
4
Depth (m)
C-org (%)

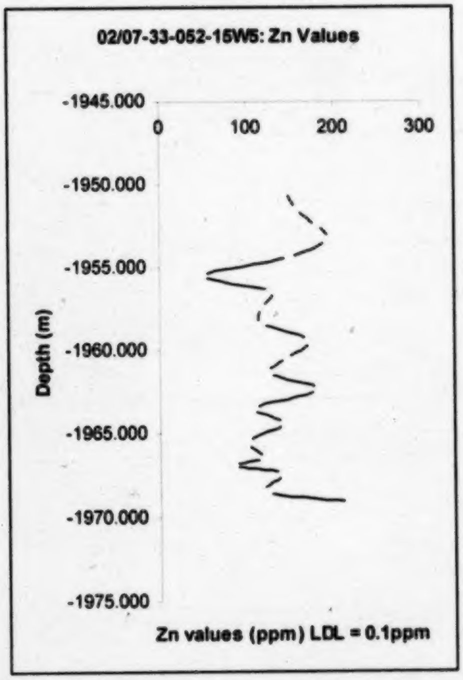

02/07-33-052-15W5: Cu Values

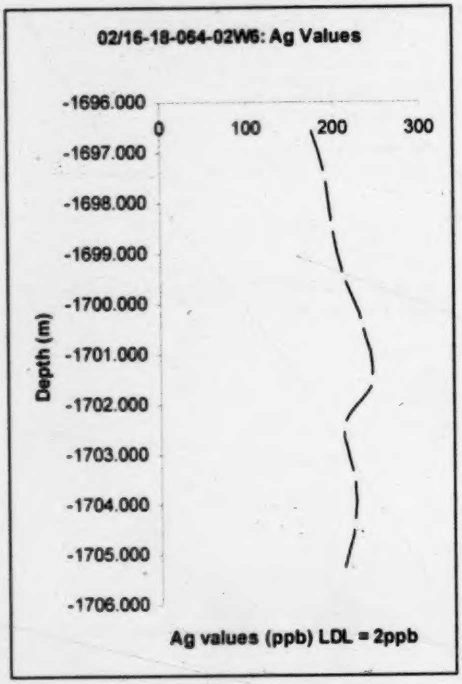

02/07-33-052-15W5: Fe Values

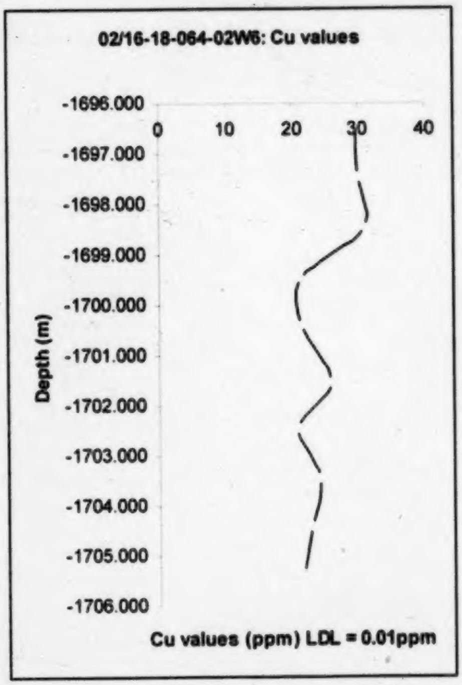

02/07-33-052-15W5: Mo Values

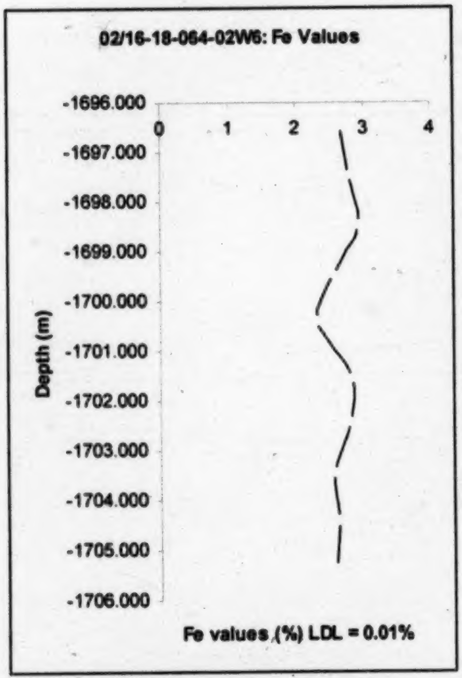

02/07-33-052-15W5: Ni Values

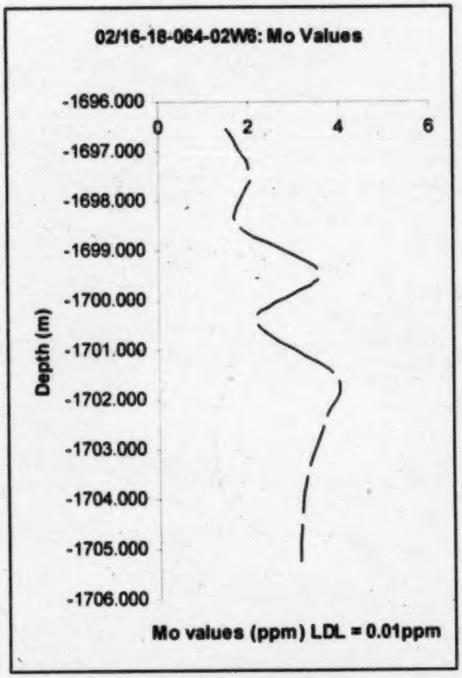

02/07-33-052-15W5: S Values
-1945.000
-1950.000
-1955.000
-1960.000
-1965.000
-1970.000
-1975.000
0
2
4
6
8
Depth (m)
S values (%) LDL = 0.01%

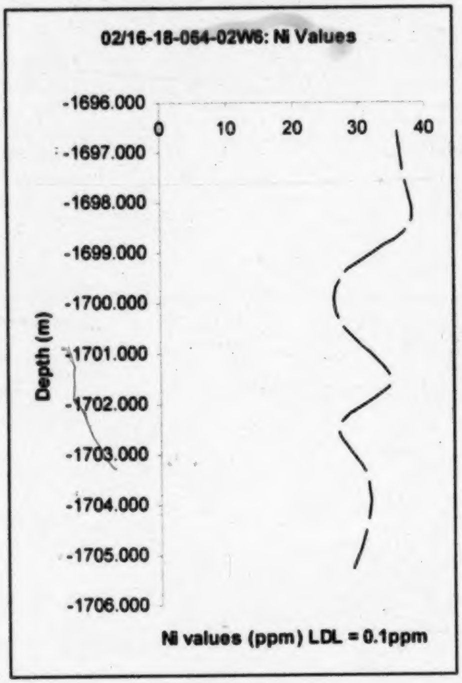

02/07-33-052-15W5: Zn Values
-1945.000
-1950.000
-1955.000
-1960.000
-1965.000
-1970.000
-1975.000
0
100
200
300
Depth (m)
Zn values (ppm) LDL = 0.1ppm

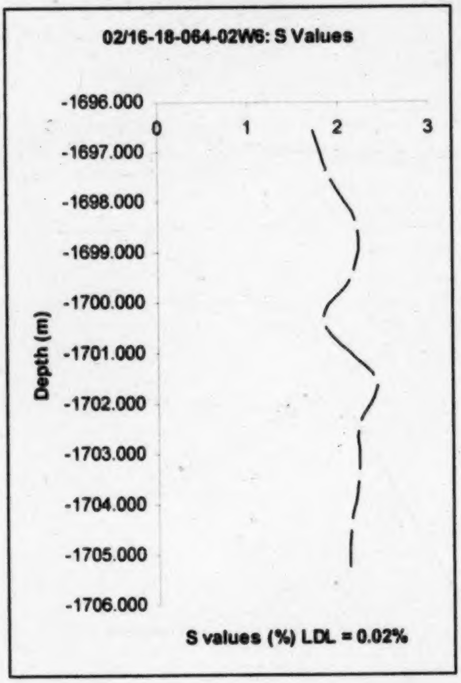

02/16-18-064-02W6: Ag Values
-1696.000
-1697.000
-1698.000
-1699.000
-1700.000
-1701.000
-1702.000
-1703.000
-1704.000
-1705.000
-1706.000
0
100
200
300
Depth (m)
Ag values (ppb) LDL = 2ppb

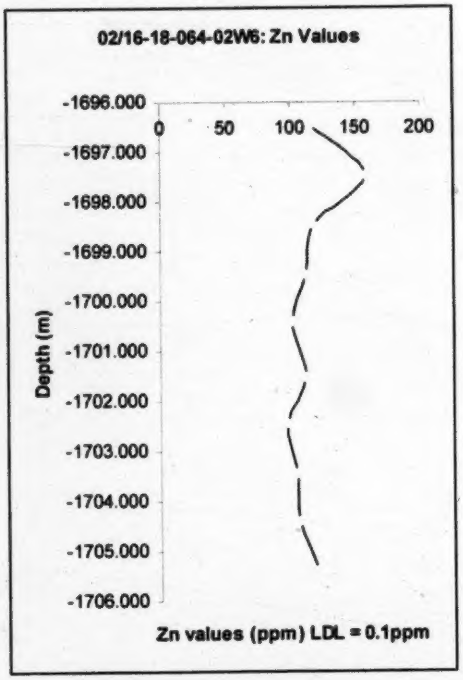

02/16-18-064-02W6: Cu values
-1696.000
-1697.000
-1698.000
-1699.000
-1700.000
-1701.000
-1702.000
-1703.000
-1704.000
-1705.000
-1706.000
0
10
20
30
40
Depth (m)
Cu values (ppm) LDL = 0.01ppm

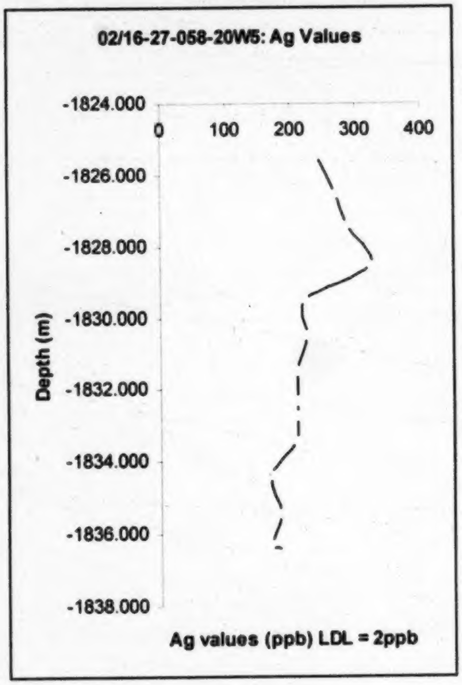

02/16-18-064-02W6: Fe Values
Depth (m)
-1696.000
-1697.000
-1698.000
-1699.000
-1700.000
-1701.000
-1702.000
-1703.000
-1704.000
-1705.000
-1706.000
0
1
2
3
4
Fe values (%) LDL = 0.01%

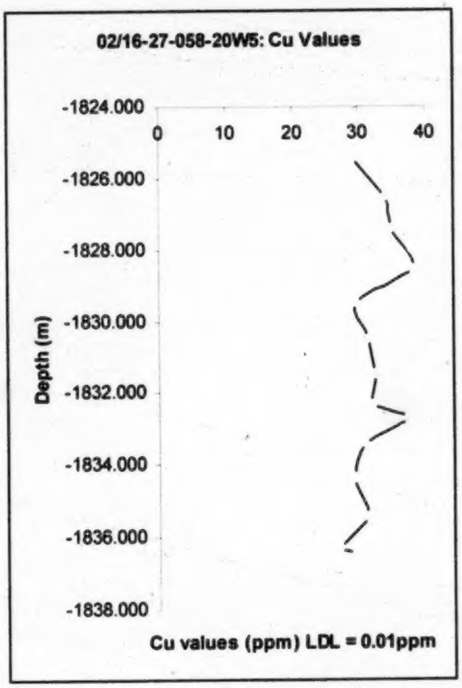

02/16-18-064-02W6: Mo Values
Depth (m)
-1696.000
-1697.000
-1698.000
-1699.000
-1700.000
-1701.000
-1702.000
-1703.000
-1704.000
-1705.000
-1706.000
0
2
4
6
Mo values (ppm) LDL = 0.01ppm

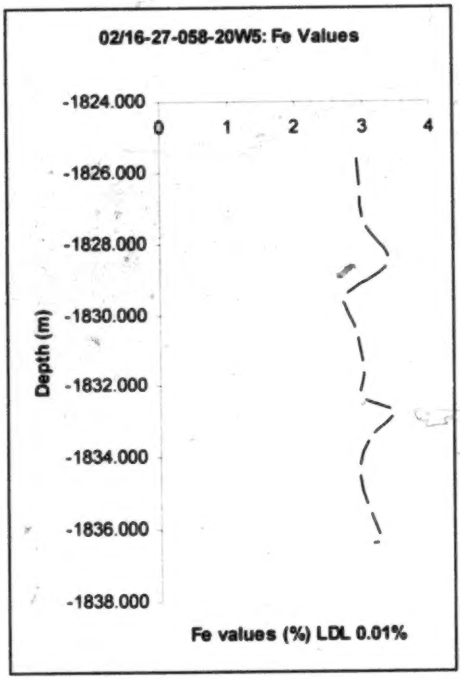

02/16-18-064-02W6: Ni Values
Depth (m)
-1696.000
-1697.000
-1698.000
-1699.000
-1700.000
-1701.000
-1702.000
-1703.000
-1704.000
-1705.000
-1706.000
0
10
20
30
40
Ni values (ppm) LDL = 0.1ppm

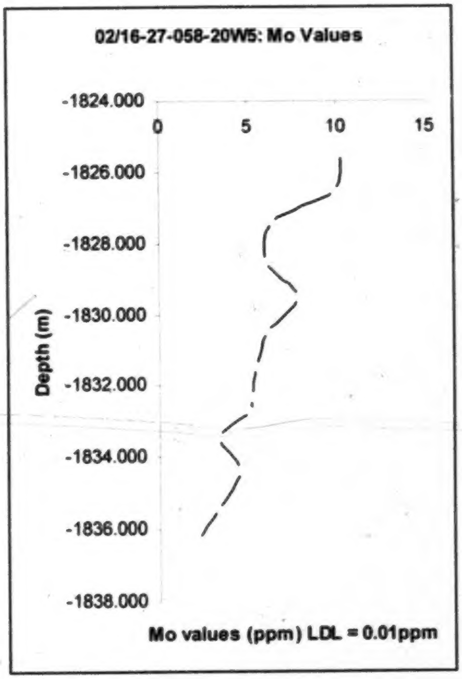

02/16-18-064-02W6: S Values
Depth (m)
-1696.000
-1697.000
-1698.000
-1699.000
-1700.000
-1701.000
-1702.000
-1703.000
-1704.000
-1705.000
-1706.000
0
1
2
3
S values (%) LDL = 0.02%

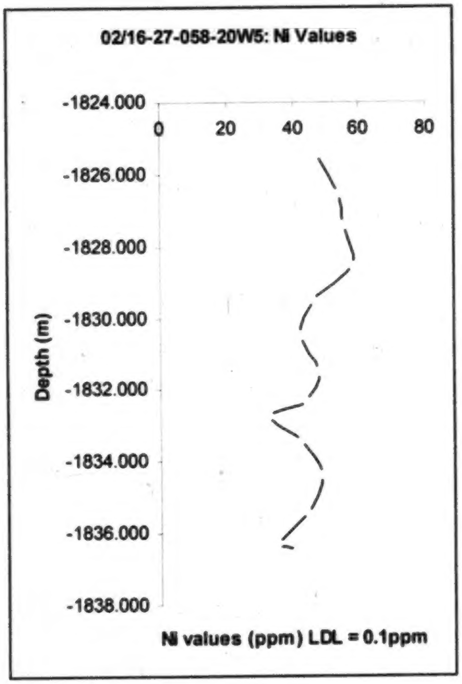

02/16-18-064-02W6: Zn Values
-1696.000
-1697.000
-1698.000
-1699.000
-1700.000
-1701.000
-1702.000
-1703.000
-1704.000
-1705.000
-1706.000
0
50
100
150
200
Depth (m)
Zn values (ppm) LDL = 0.1ppm

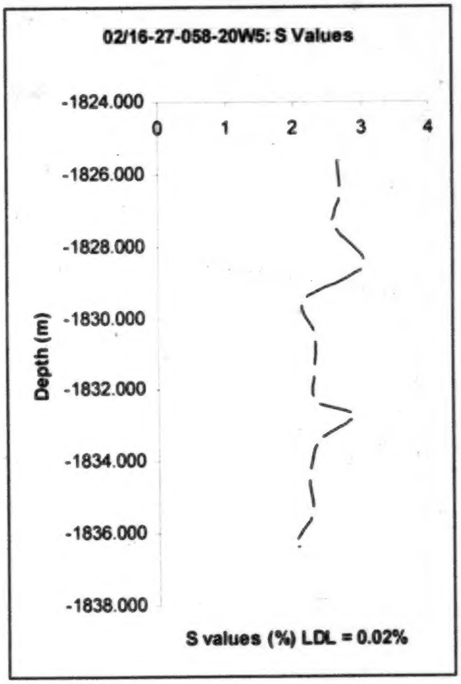

02/16-27-058-20W5: Ag Values
-1824.000
-1826.000
-1828.000
-1830.000
-1832.000
-1834.000
-1836.000
-1838.000
0
100
200
300
400
Depth (m)
Ag values (ppb) LDL = 2ppb

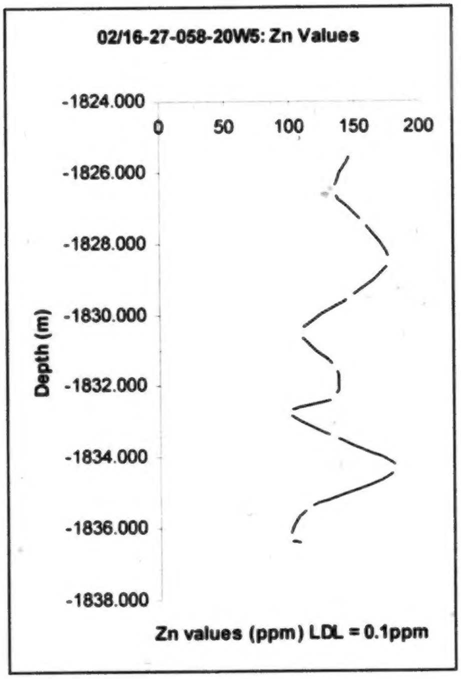

02/16-27-058-20W5: Cu Values
-1824.000
-1826.000
-1828.000
-1830.000
-1832.000
-1834.000
-1836.000
-1838.000
0
10
20
30
40
Depth (m)
Cu values (ppm) LDL = 0.01ppm

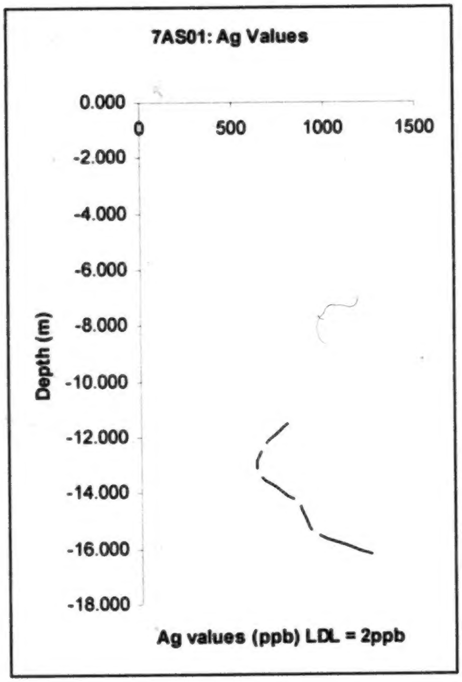

02/16-27-058-20W5: Fe Values
Depth (m)
-1824.000
-1826.000
-1828.000
-1830.000
-1832.000
-1834.000
-1836.000
-1838.000
0
1
2
3
4
Fe values (%) LDL 0.01%

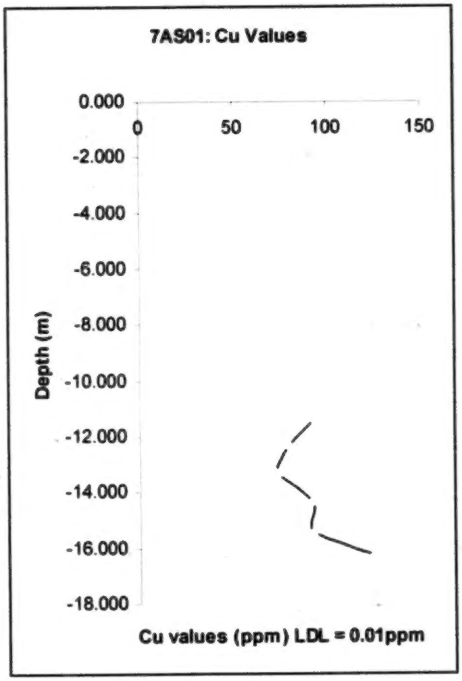

02/16-27-058-20W5: Mo Values
Depth (m)
-1824.000
-1826.000
-1828.000
-1830.000
-1832.000
-1834.000
-1836.000
-1838.000
0
5
10
15
Mo values (ppm) LDL = 0.01ppm

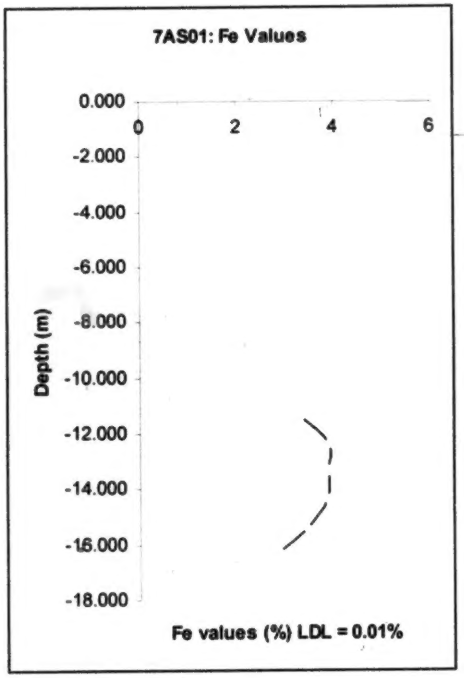

02/16-27-058-20W5: Ni Values
Depth (m)
-1824.000
-1826.000
-1828.000
-1830.000
-1832.000
-1834.000
-1836.000
-1838.000
0
20
40
60
80
Ni values (ppm) LDL = 0.1ppm

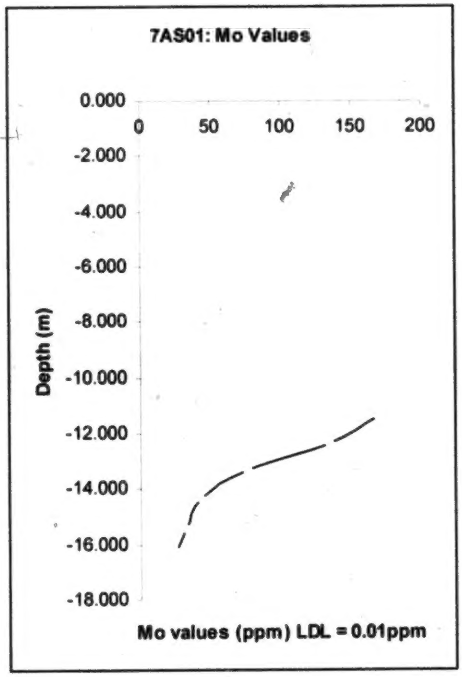

02/16-27-058-20W5: S Values
Depth (m)
-1824.000
-1826.000
-1828.000
-1830.000
-1832.000
-1834.000
-1836.000
-1838.000
0
1
2
3
4
S values (%) LDL = 0.02%

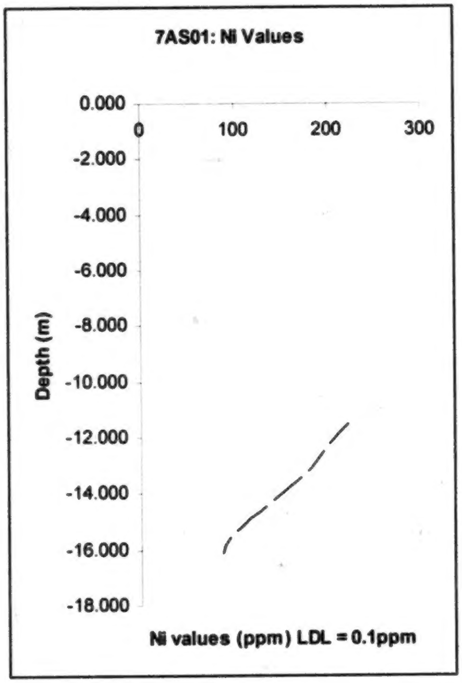

02/16-27-058-20W5: Zn Values
-1824.000
0
50
100
150
200
-1826.000
-1828.000
-1830.000
-1832.000
-1834.000
-1836.000
-1838.000
Depth (m)
Zn values (ppm) LDL = 0.1ppm

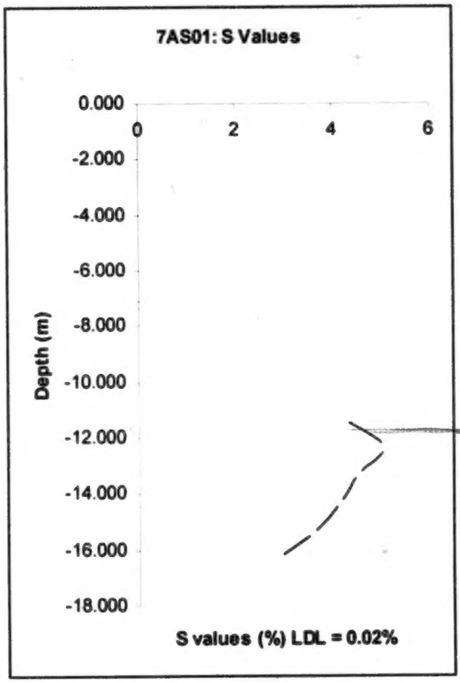

7AS01: Ag Values
0.000
0
500
1000
1500
-2.000
-4.000
-6.000
-8.000
-10.000
-12.000
-14.000
-16.000
-18.000
Depth (m)
Ag values (ppb) LDL = 2ppb

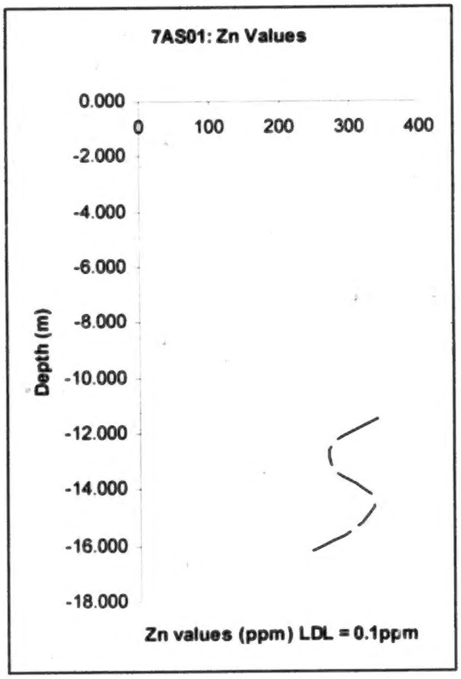

7AS01: Cu Values
0.000
0
50
100
150
-2.000
-4.000
-6.000
-8.000
-10.000
-12.000
-14.000
-16.000
-18.000
Depth (m)
Cu values (ppm) LDL = 0.01ppm

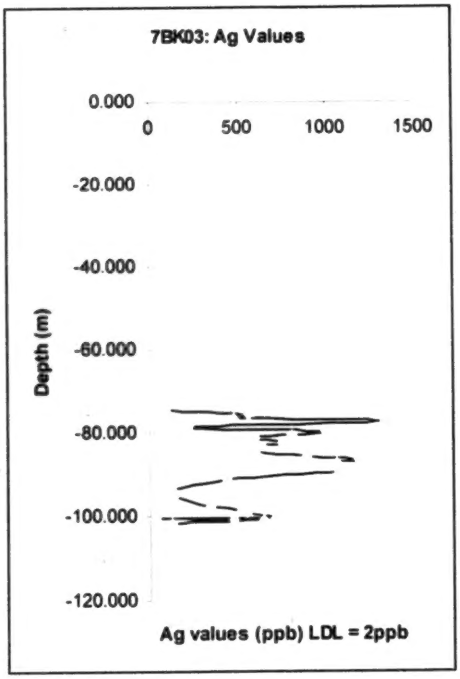

7AS01: Fe Values
0.000
-2.000
-4.000
-6.000
-8.000
-10.000
-12.000
-14.000
-16.000
-18.000
Depth (m)
0
2
4
6
Fe values (%) LDL = 0.01%

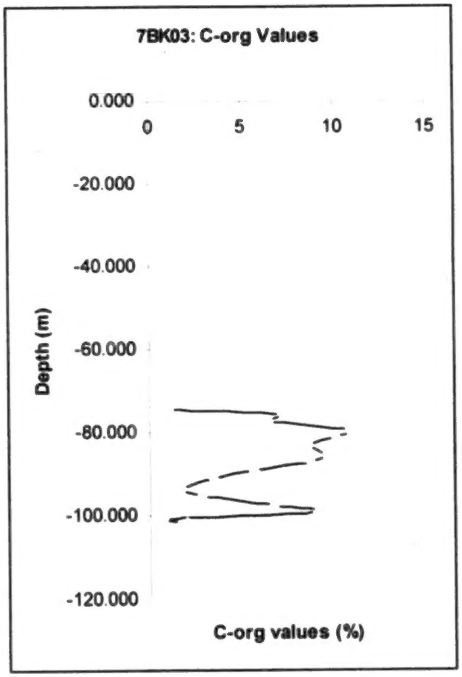

7AS01: Mo Values
0.000
-2.000
-4.000
-6.000
-8.000
-10.000
-12.000
-14.000
-16.000
-18.000
Depth (m)
0
50
100
150
200
Mo values (ppm) LDL = 0.01ppm

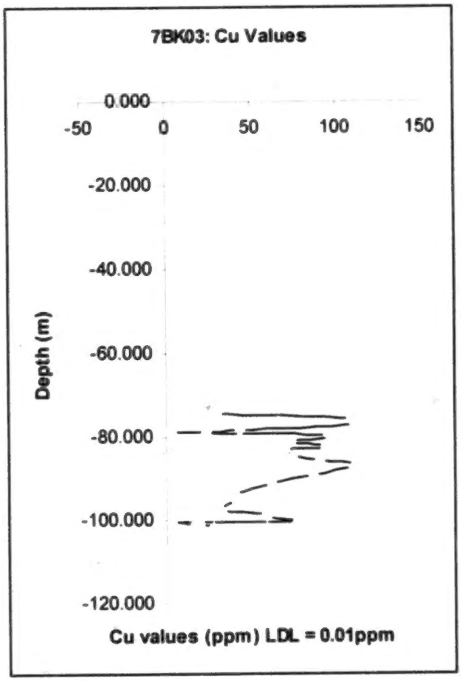

7AS01: Ni Values
0.000
-2.000
-4.000
-6.000
-8.000
-10.000
-12.000
-14.000
-16.000
-18.000
Depth (m)
0
100
200
300
Ni values (ppm) LDL = 0.1ppm

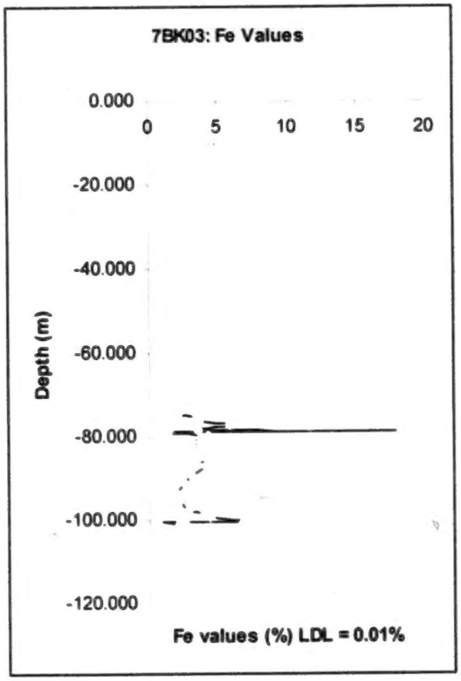

7AS01: S Values
0.000
-2.000
-4.000
-6.000
-8.000
-10.000
-12.000
-14.000
-16.000
-18.000
Depth (m)
0
2
4
6
S values (%) LDL = 0.02%

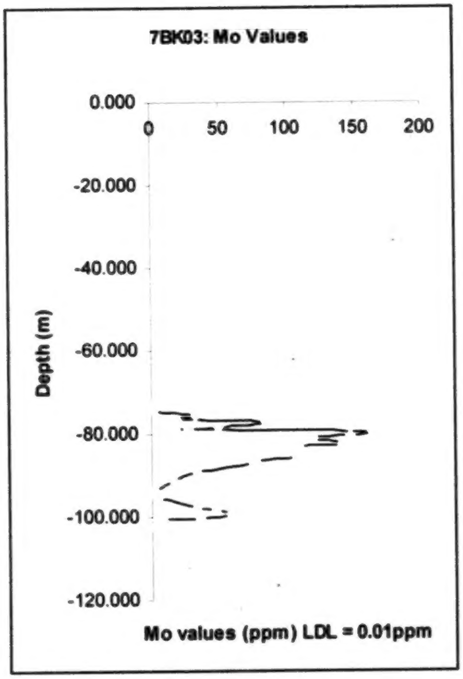

7AS01: Zn Values
0.000
-2.000
-4.000
-6.000
-8.000
-10.000
-12.000
-14.000
-16.000
-18.000
0
100
200
300
400
Depth (m)
Zn values (ppm) LDL = 0.1ppm

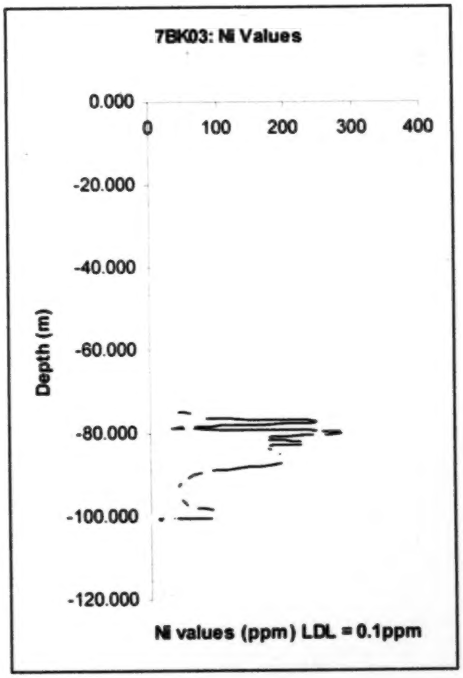

7BK03: Ag Values
0.000
0
500
1000
1500
-20.000
-40.000
-60.000
-80.000
-100.000
-120.000
Depth (m)
Ag values (ppb) LDL = 2ppb

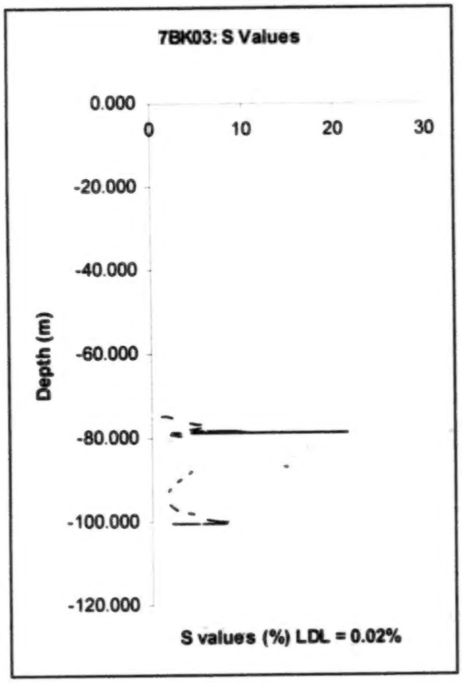

7BK03: C-org Values
0.000
0
5
10
15
-20.000
-40.000
-60.000
-80.000
-100.000
-120.000
Depth (m)
C-org values (%)

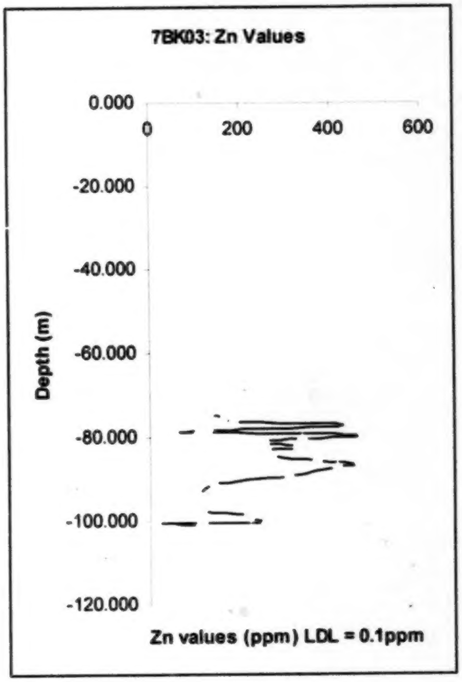

7BK03: Cu Values
0.000
-50
0
50
100
150
-20.000
-40.000
-60.000
-80.000
-100.000
-120.000
Depth (m)
Cu values (ppm) LDL = 0.01ppm


7BK03: Fe Values
0.000
0
5
10
15
20
-20.000
-40.000
-60.000
-80.000
-100.000
-120.000
Depth (m)
Fe values (%) LDL = 0.01%


7BK03: Mo Values
0.000
-20.000
-40.000
-60.000
-80.000
-100.000
-120.000
Depth (m)
0
50
100
150
200
Mo values (ppm) LDL = 0.01ppm


7BK03: Ni Values
0.000
-20.000
-40.000
-60.000
-80.000
-100.000
-120.000
Depth (m)
0
100
200
300
400
Ni values (ppm) LDL = 0.1ppm


7BK03: S Values
0.000
-20.000
-40.000
-60.000
-80.000
-100.000
-120.000
Depth (m)
0
10
20
30
S values (%) LDL = 0.02%


7BK03: Zn Values
0.000
-20.000
-40.000
-60.000
-80.000
-100.000
-120.000
Depth (m)
0
200
400
600
Zn values (ppm) LDL = 0.1ppm